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THE FAR EASTERN REVIEW

FINANCE ENGINEERING COMMERCE

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Dr. SUN AND THE CUSTOMS

THE JAPANESE EARTHQUAKE

IRRIGATION IN THE PHILIPPINES
PORT OF SABANG
TEA INDUSTRY OF JAVA
INDO-CHINA RAILWAYS
ADMINISTRATION BY ELECTRICITY
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Vol. XX
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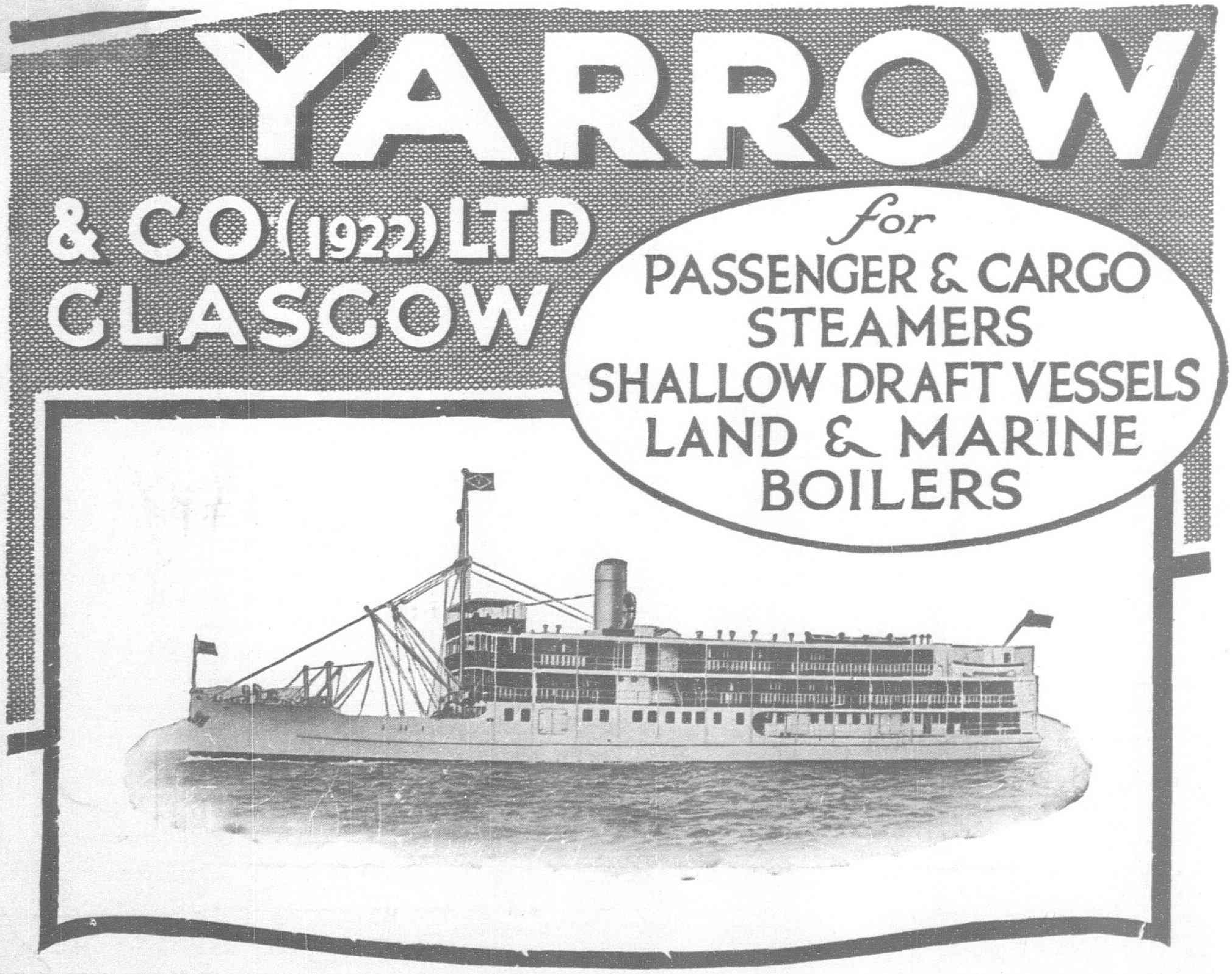

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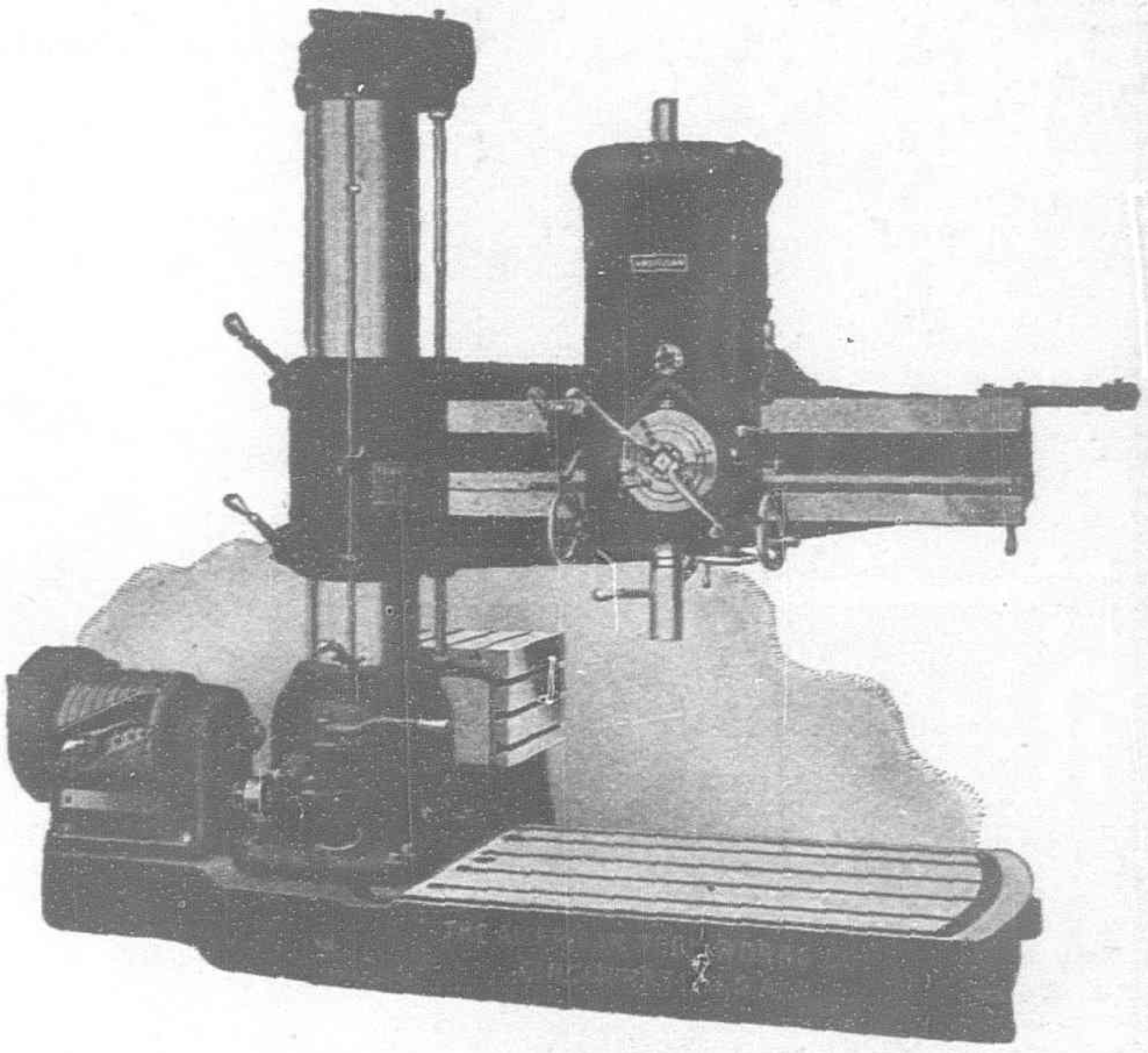

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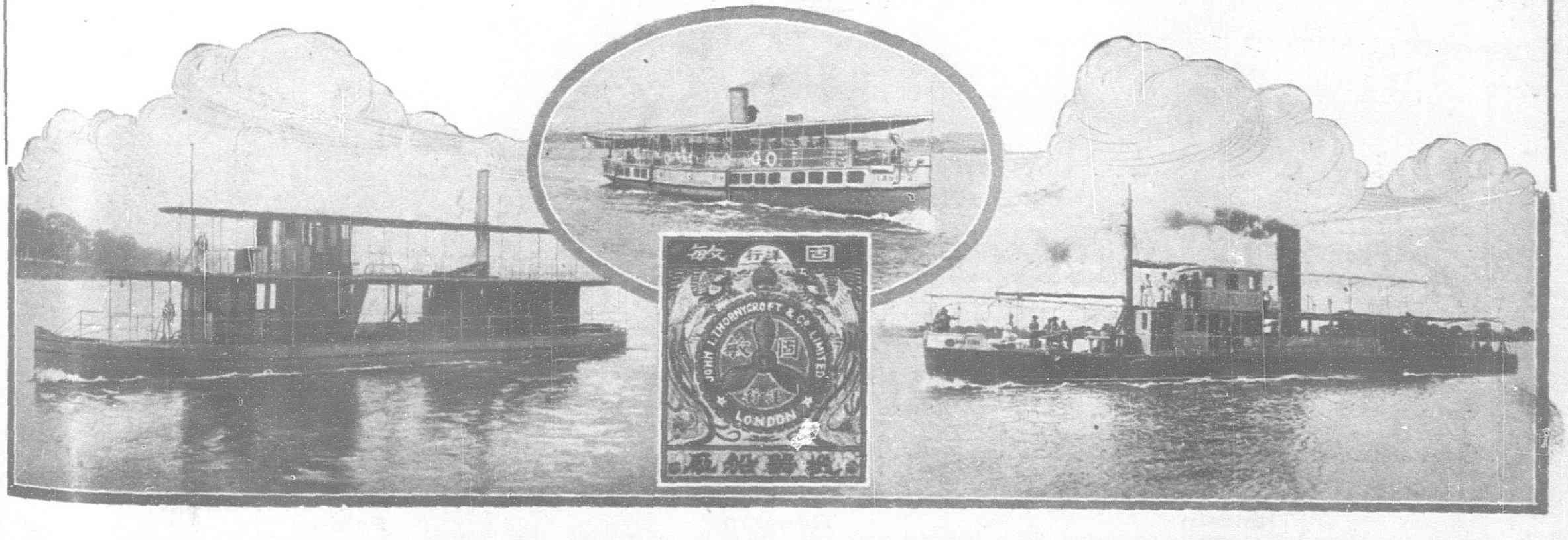

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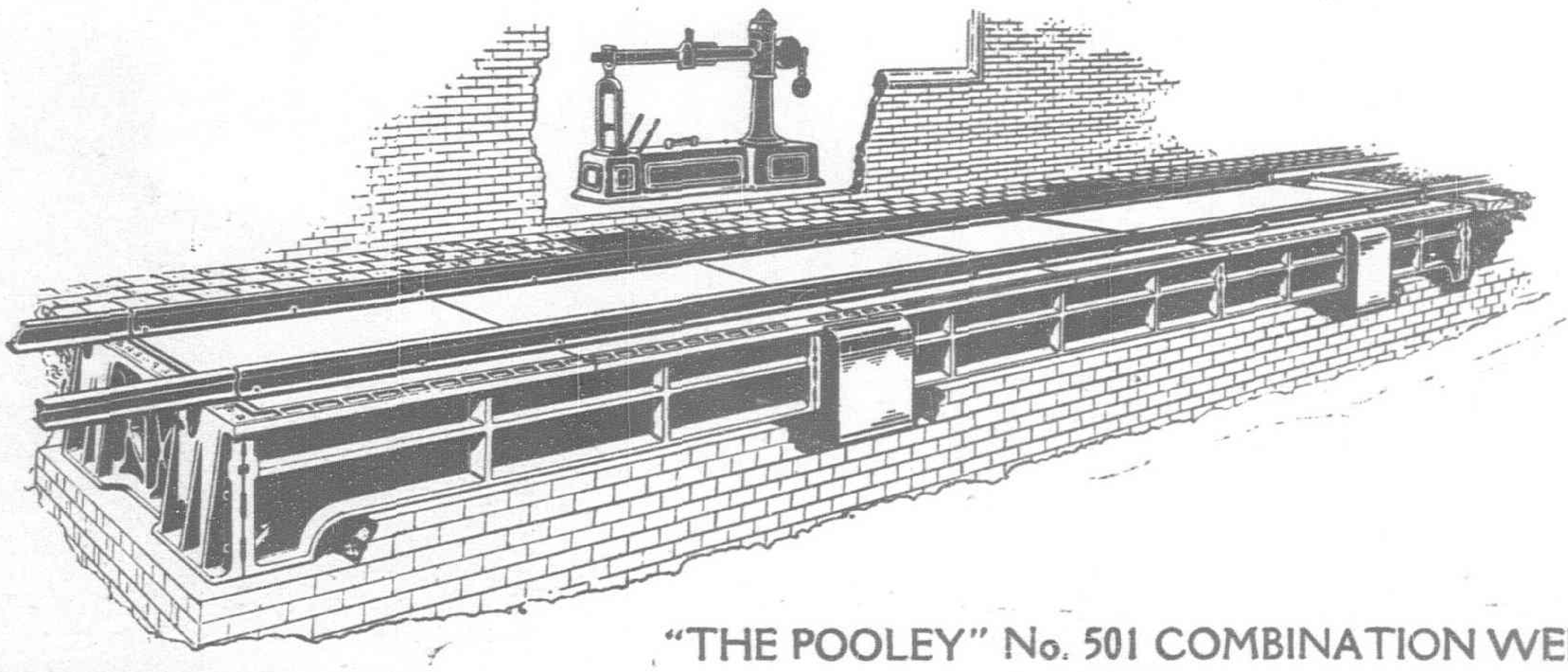

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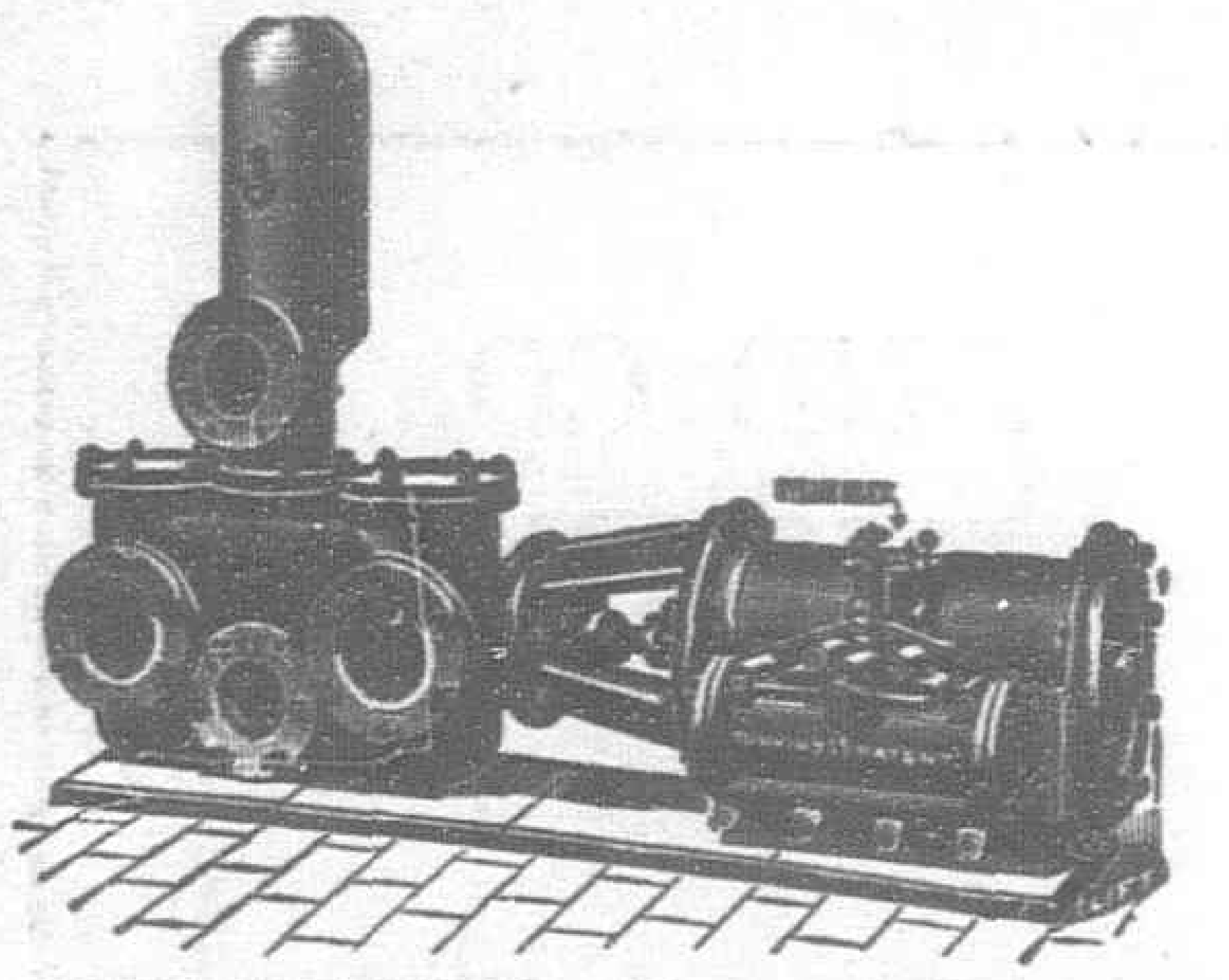

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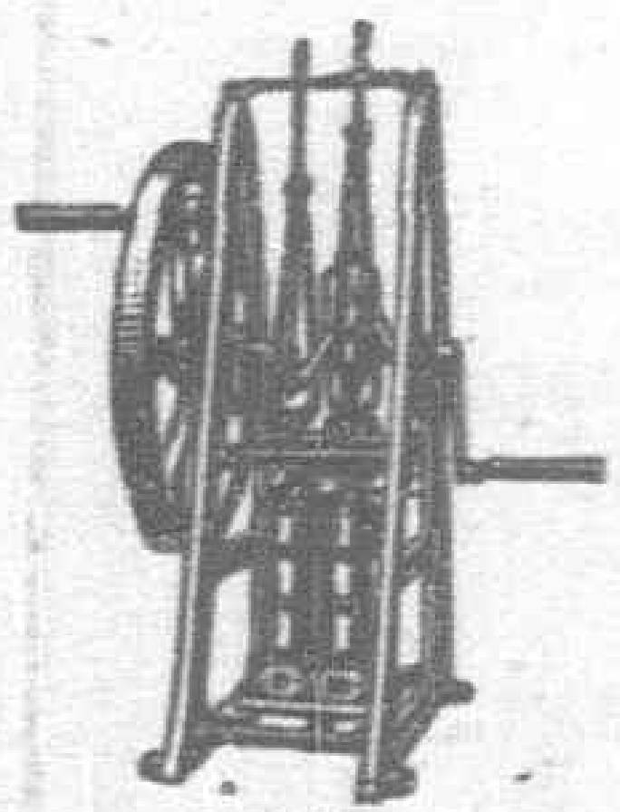

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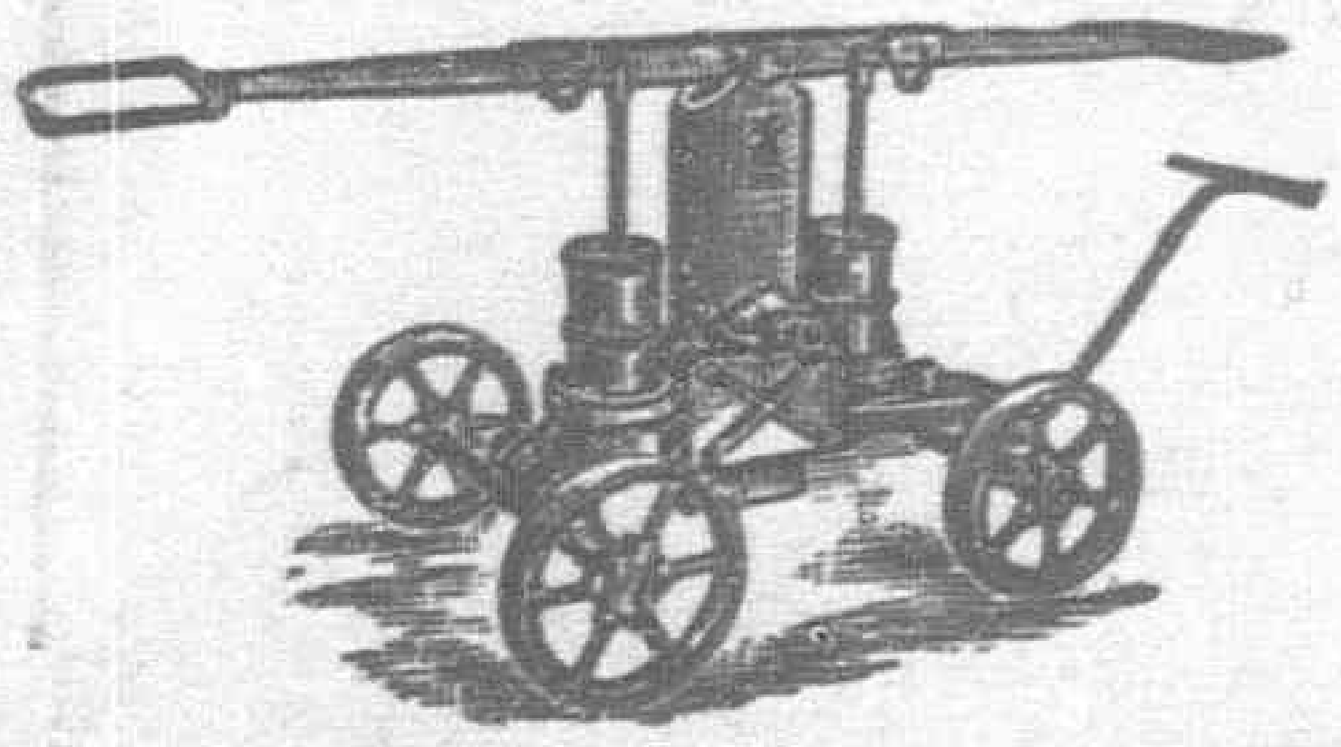
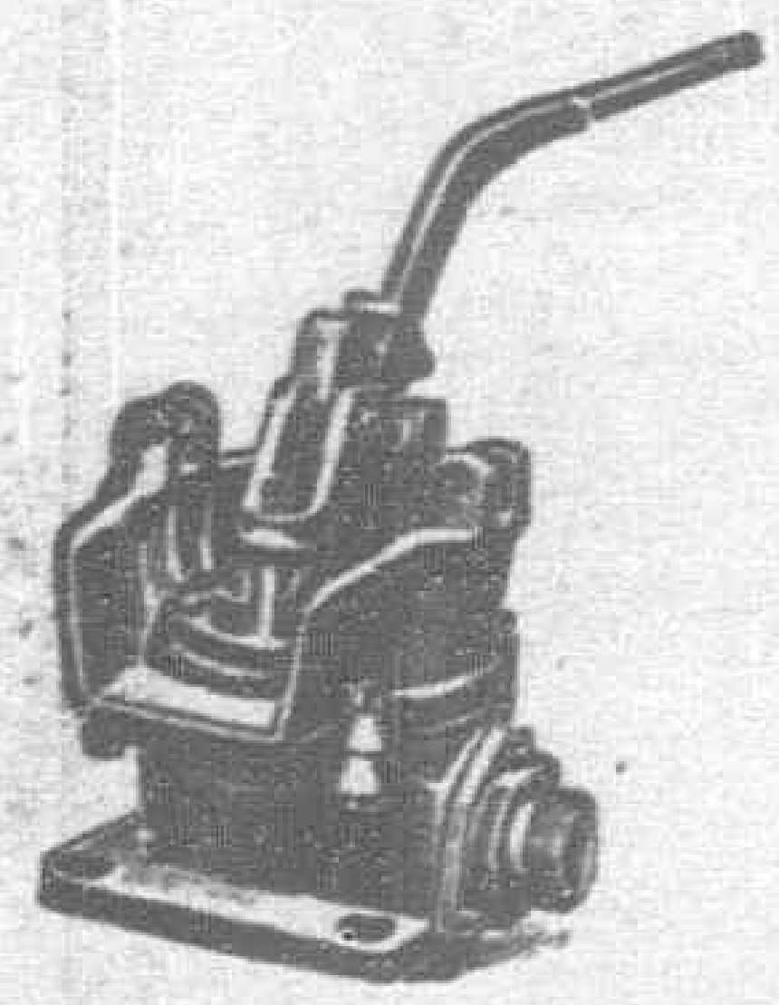
Fig.160.





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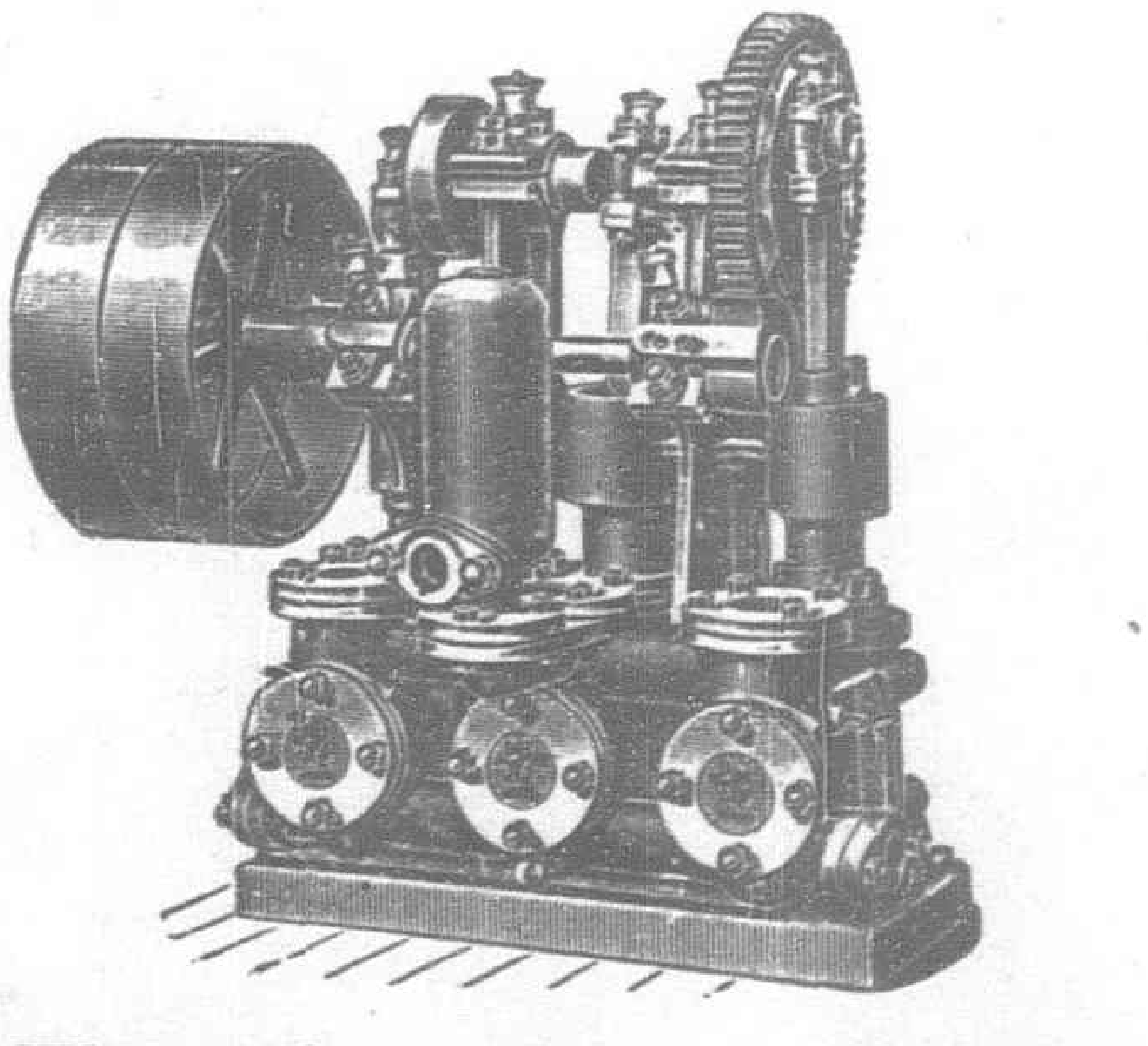

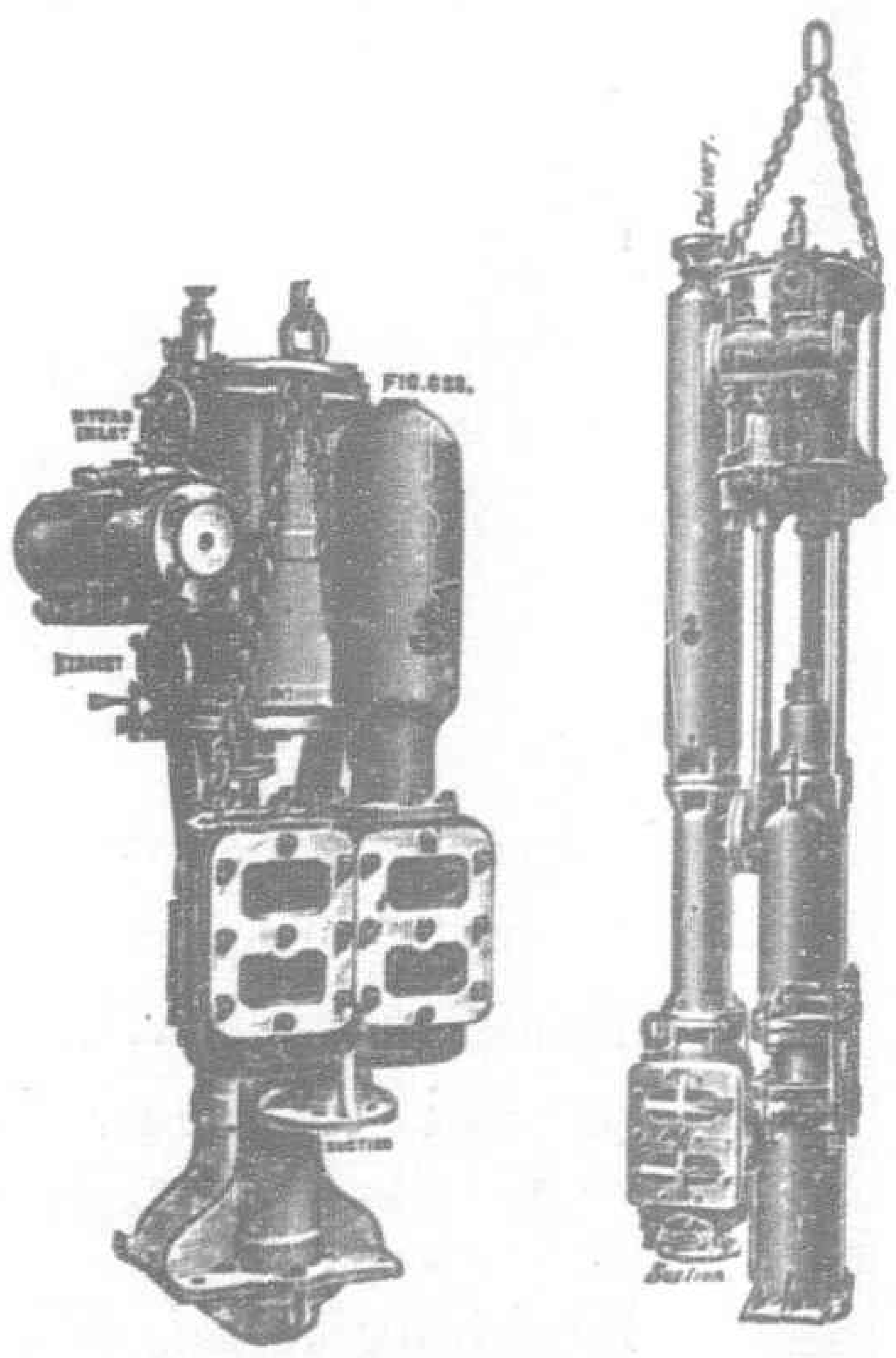

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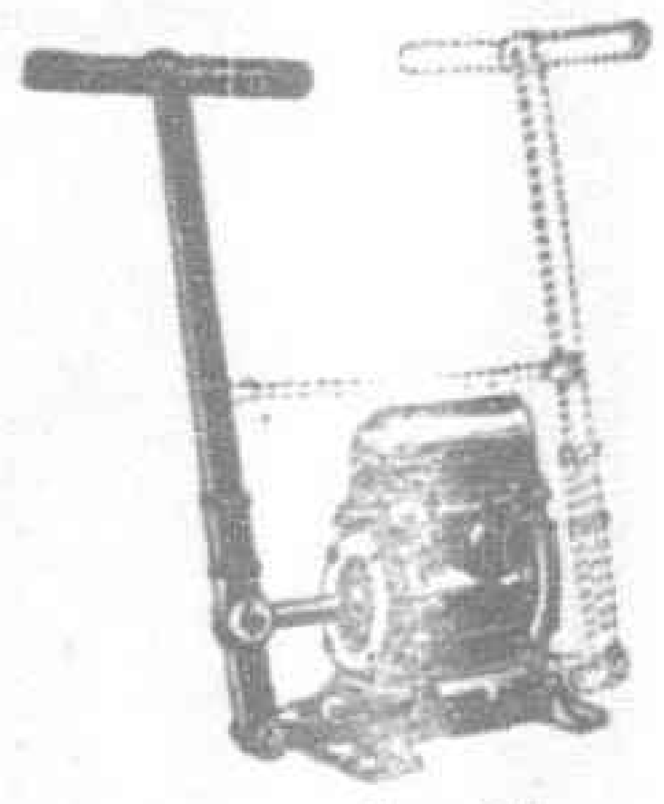

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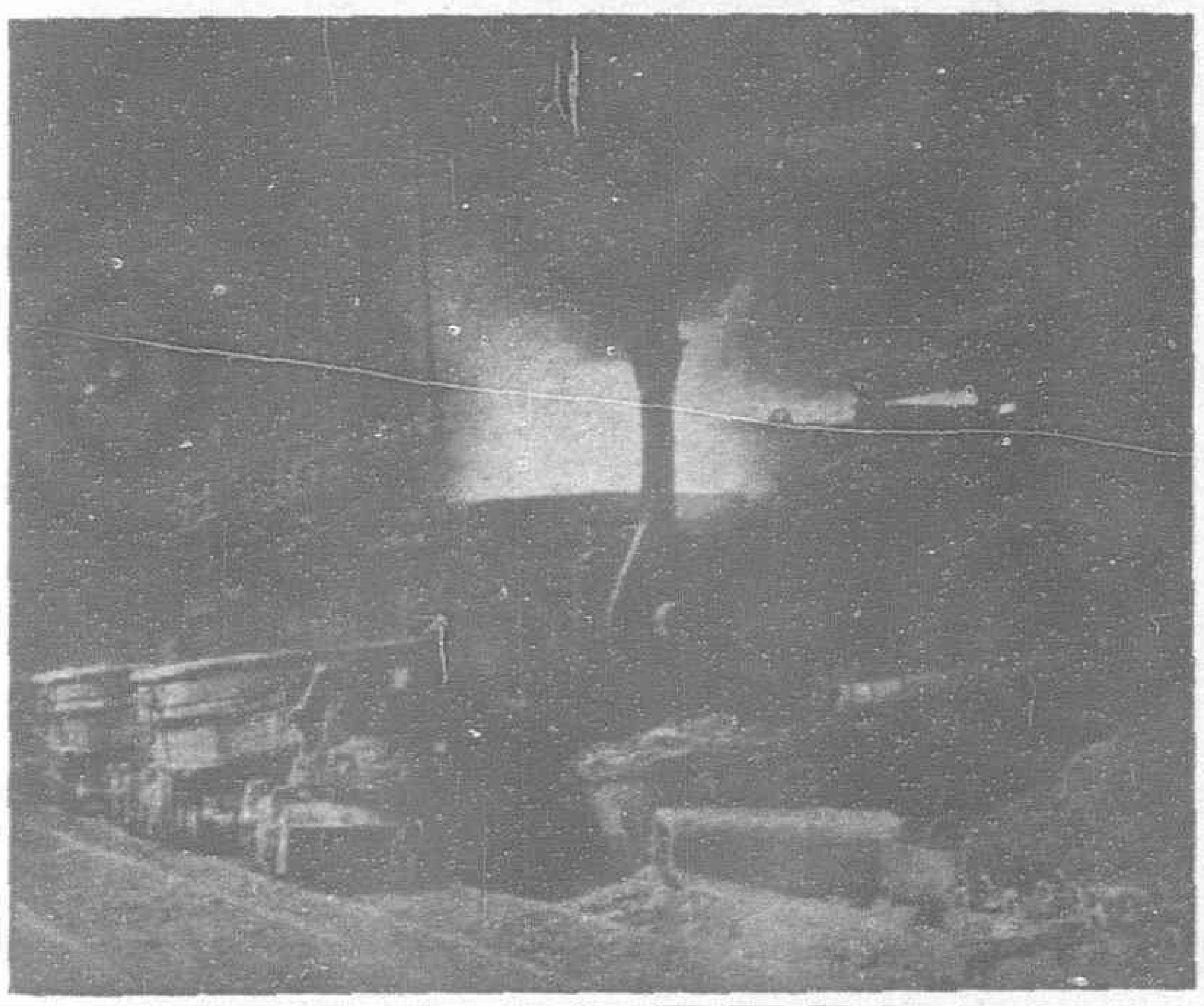

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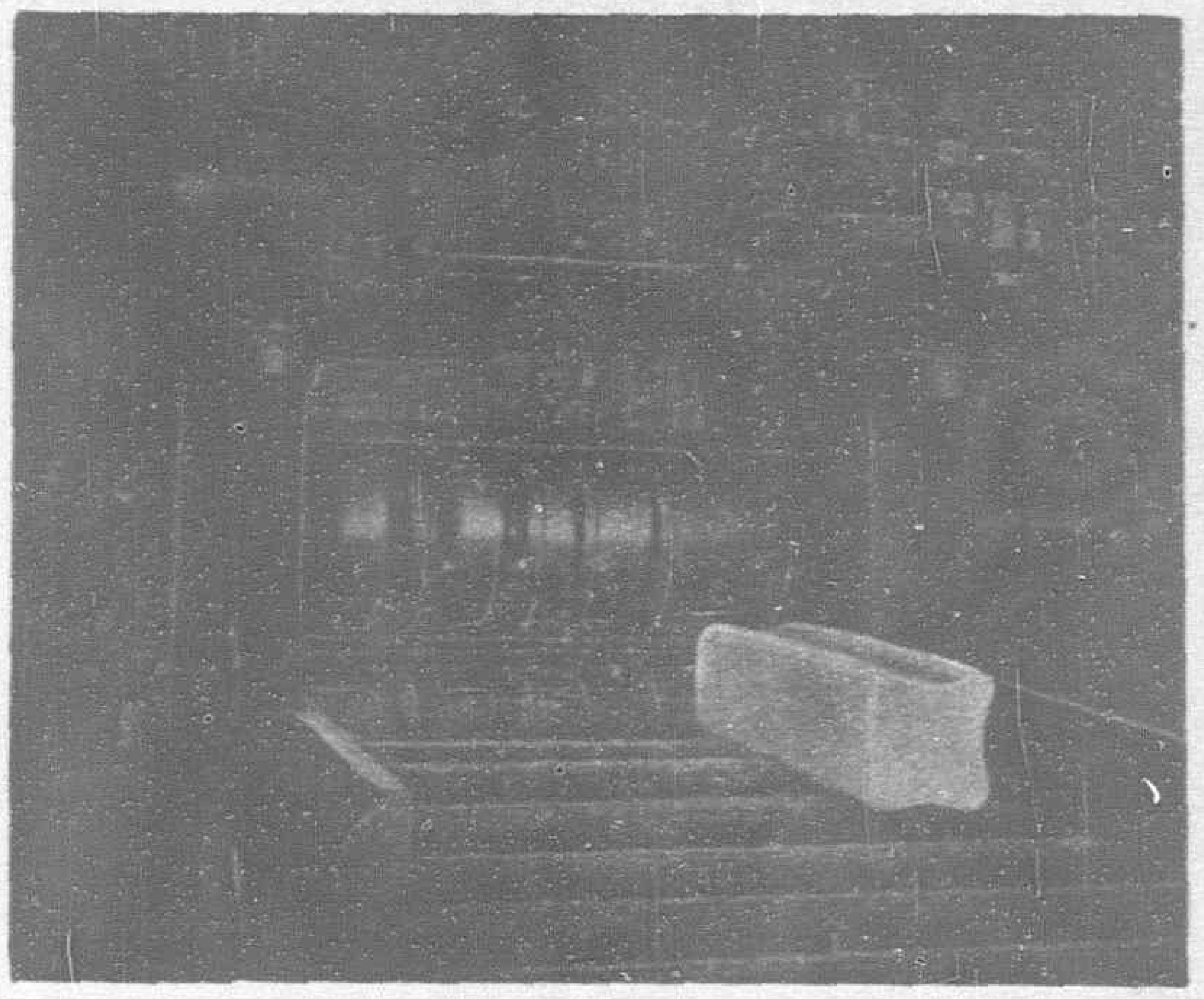

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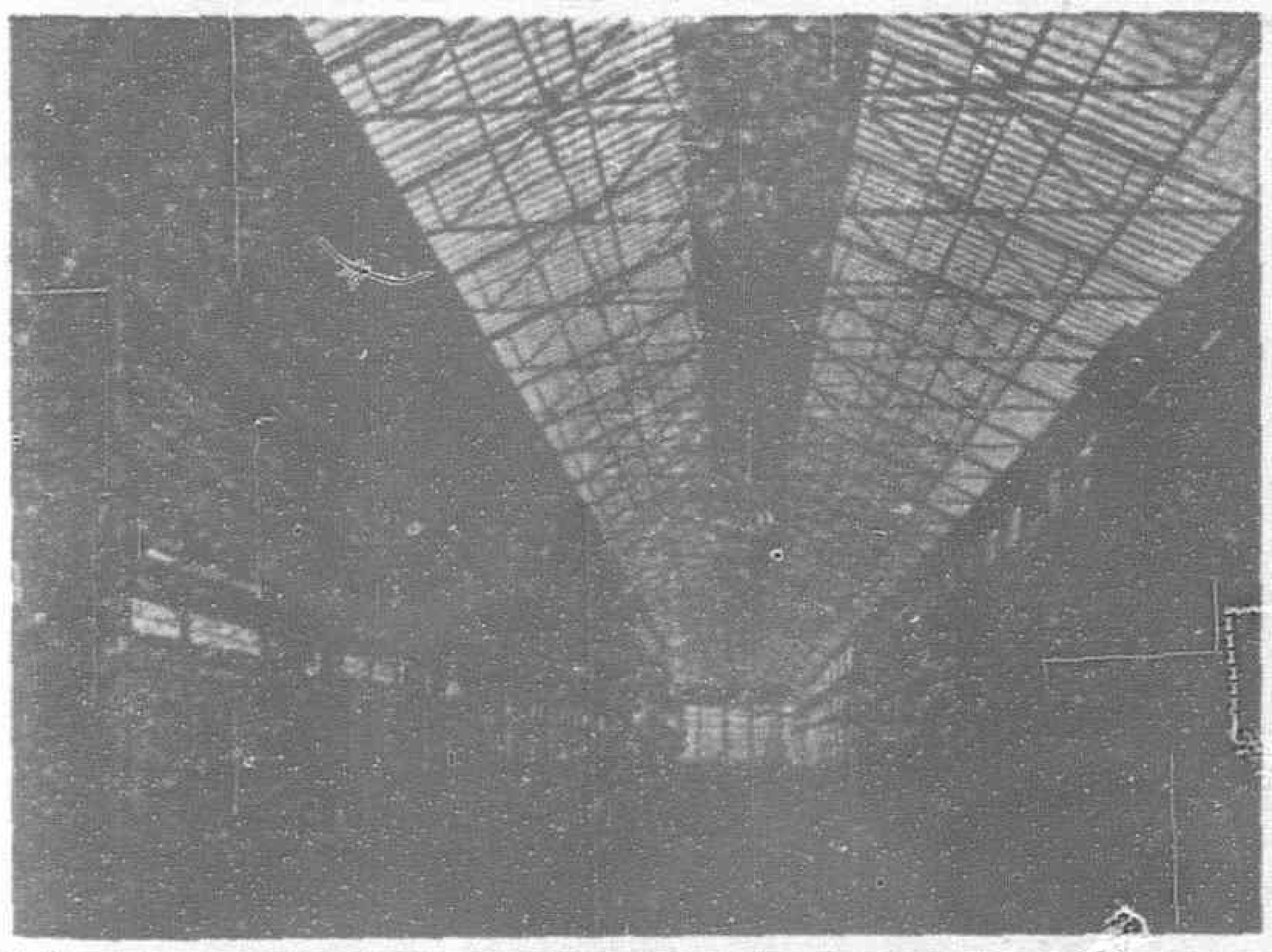

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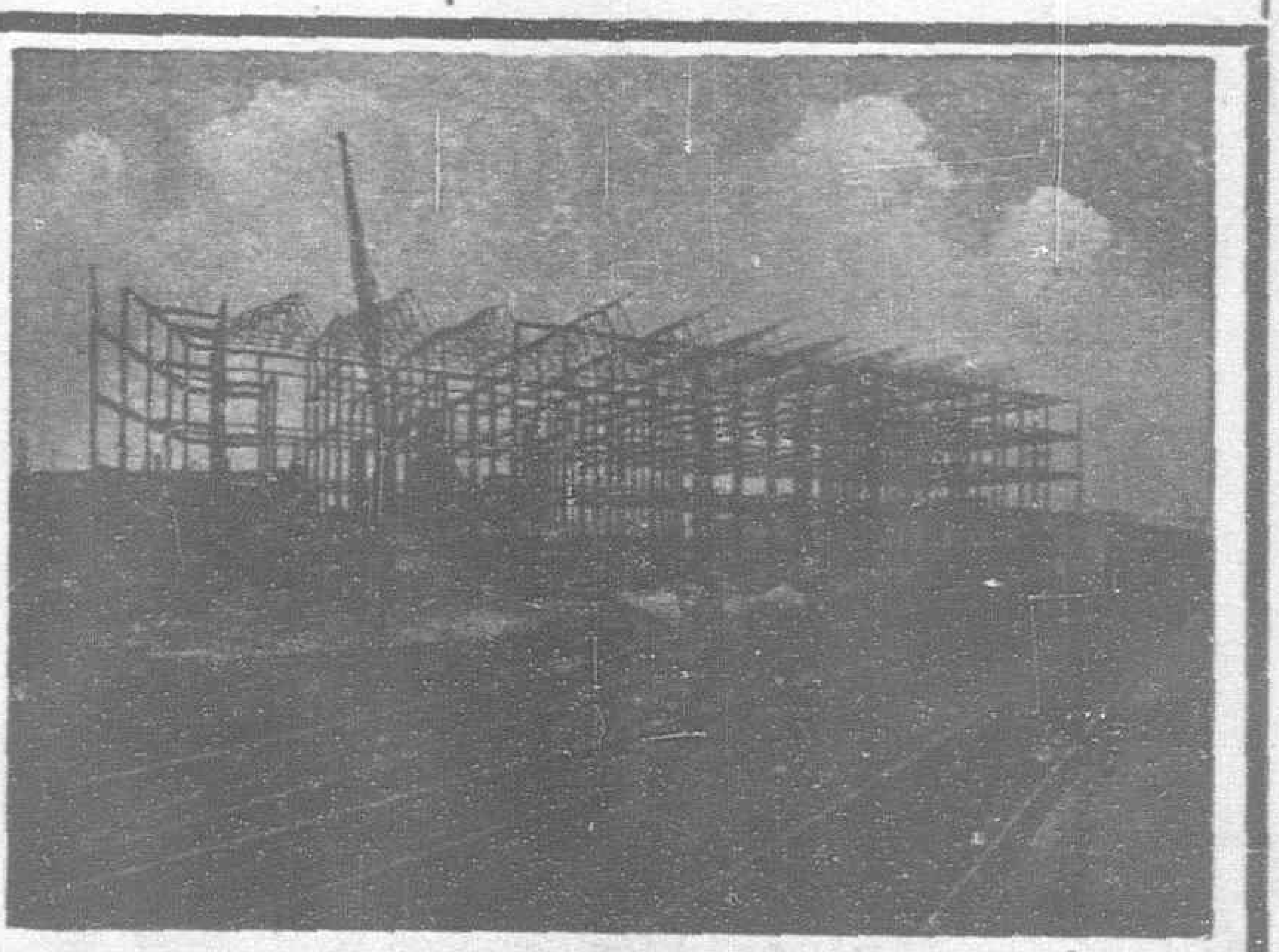

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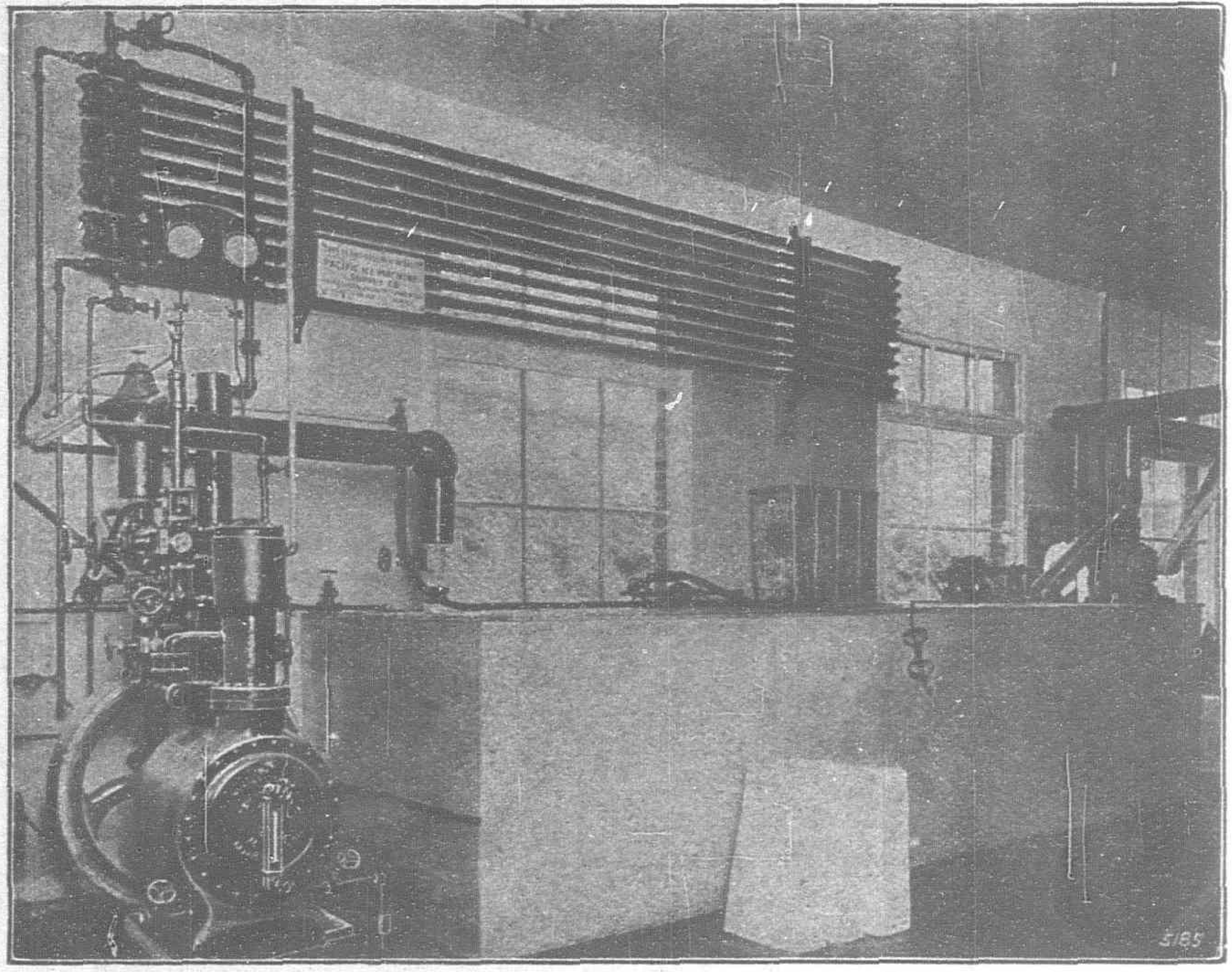

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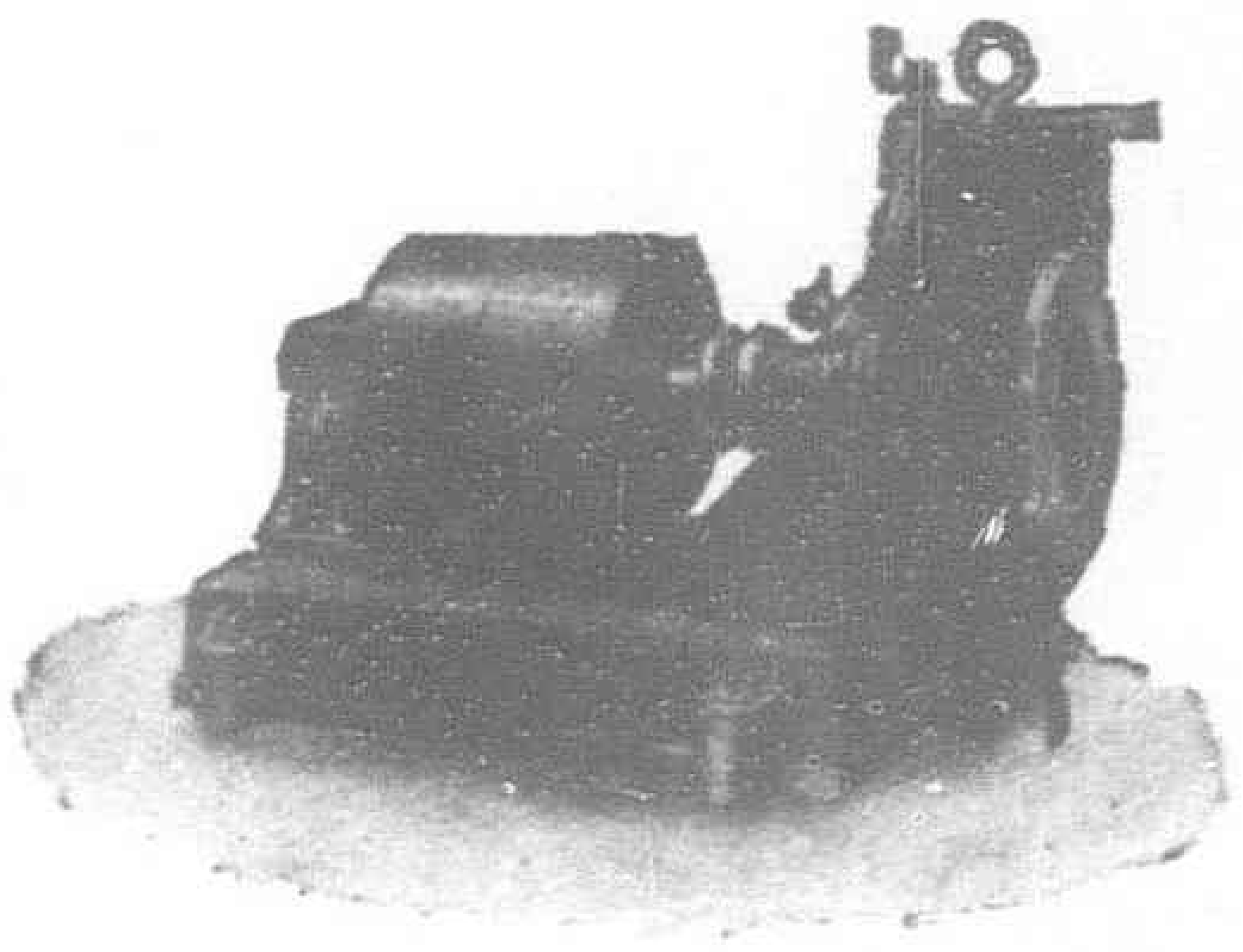

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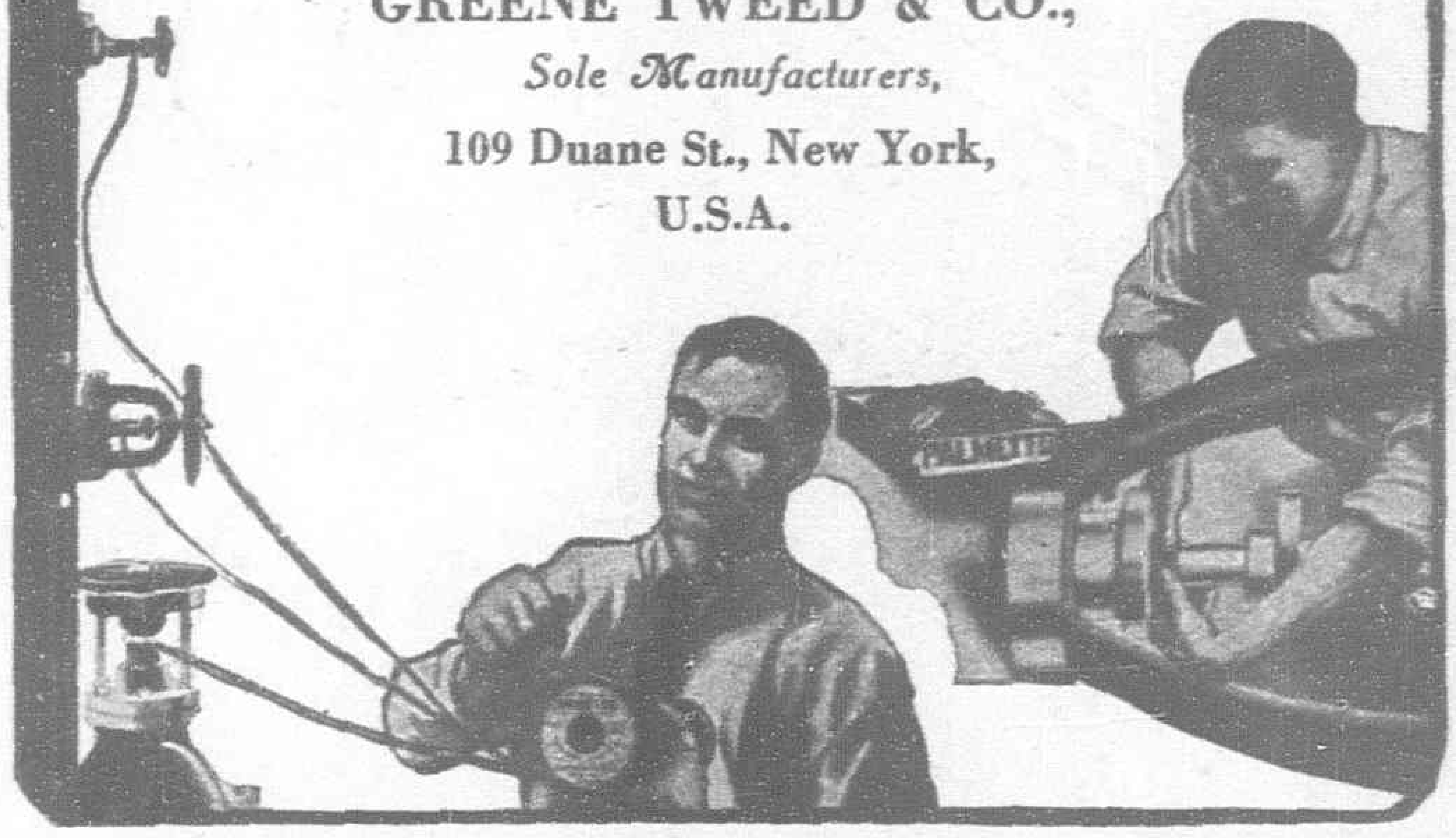

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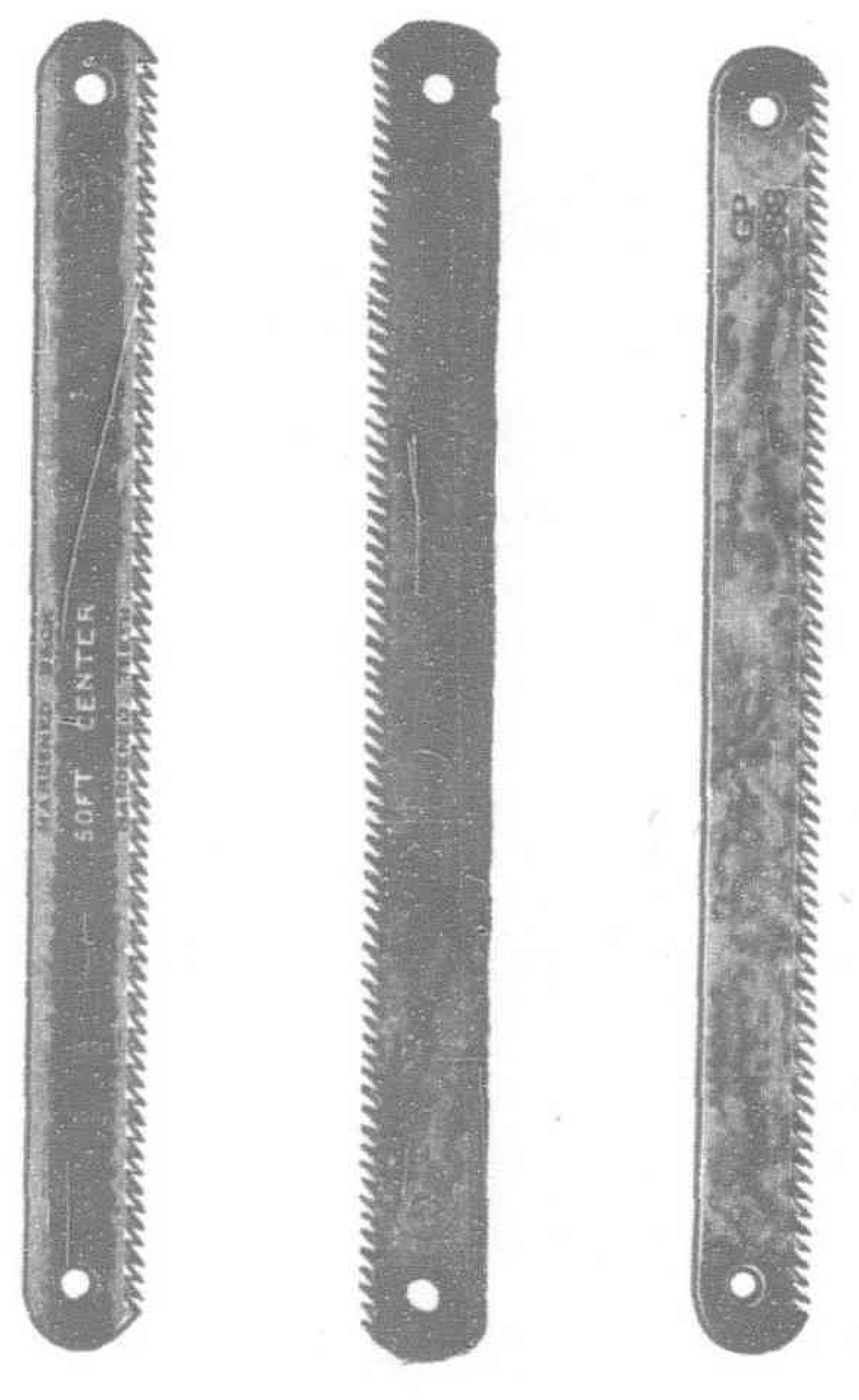

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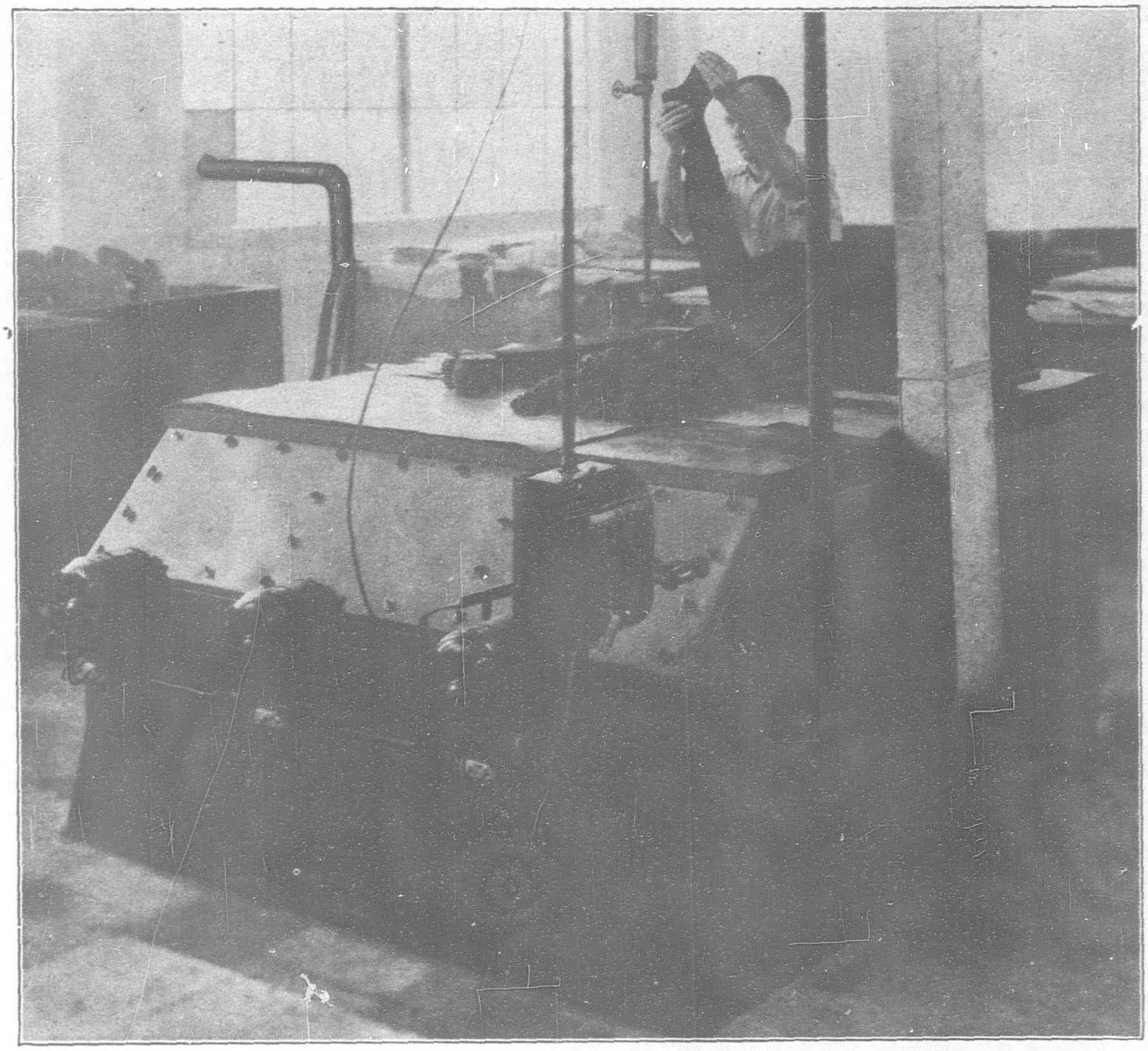

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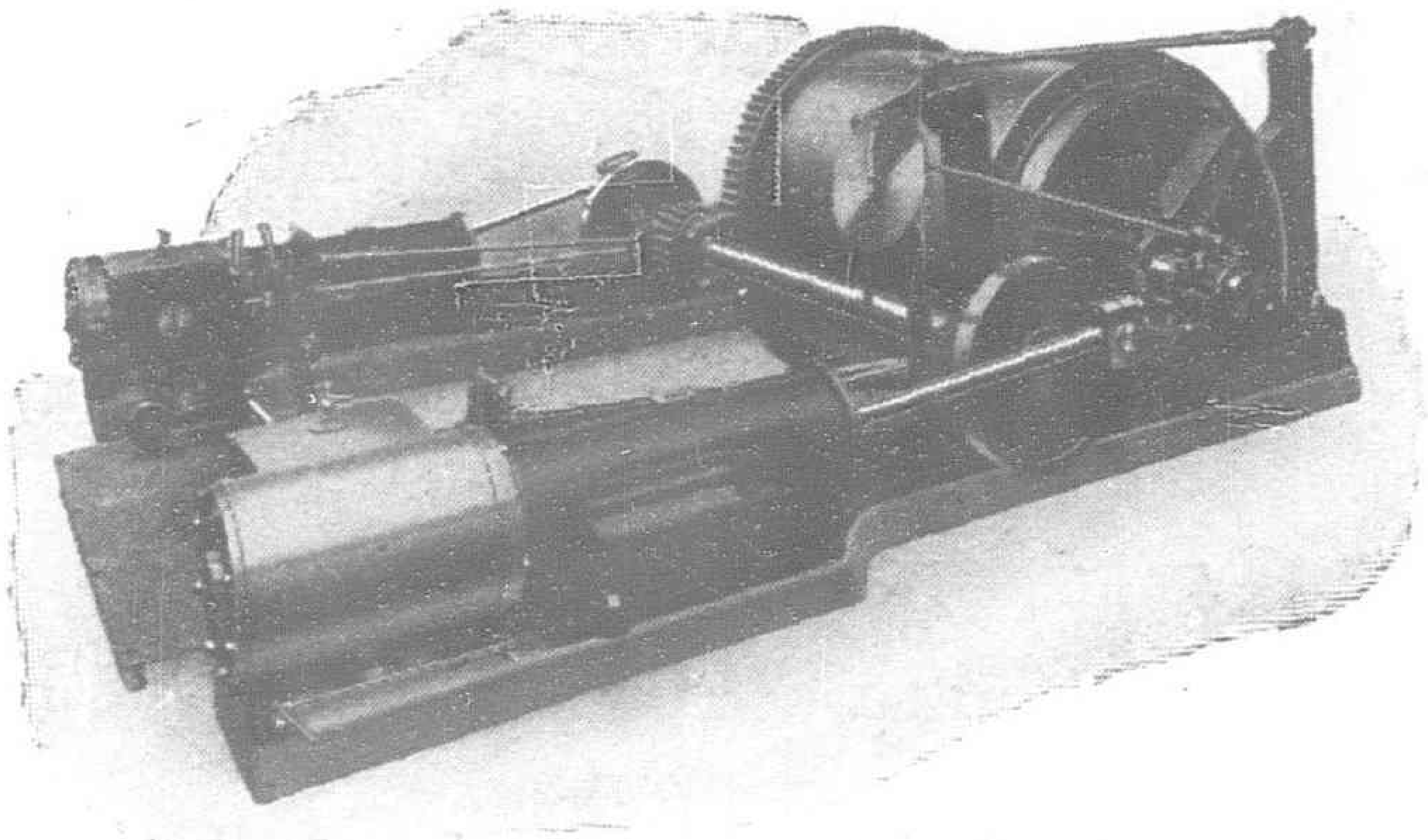

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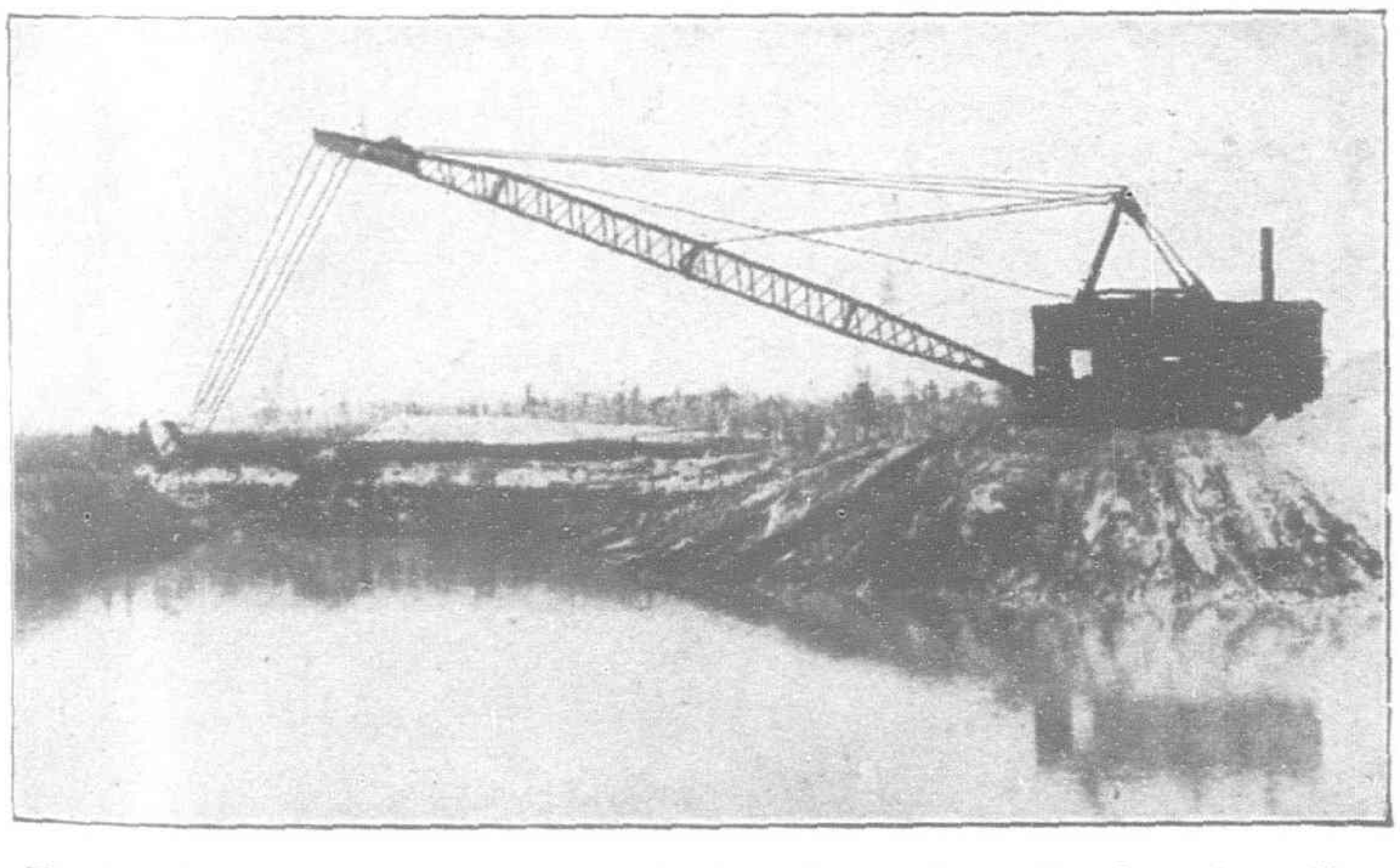

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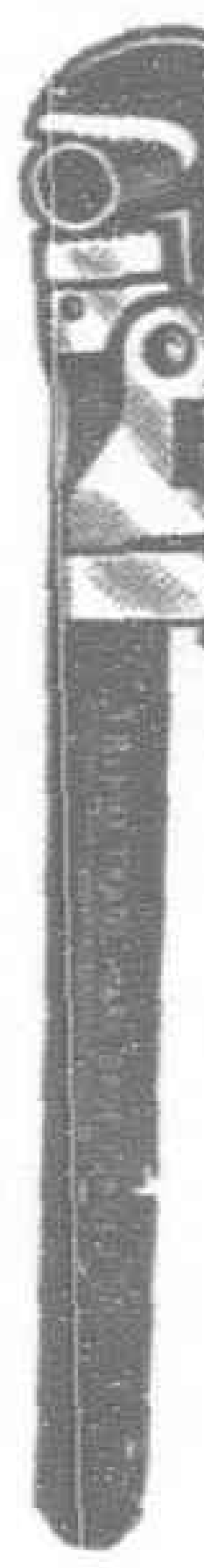

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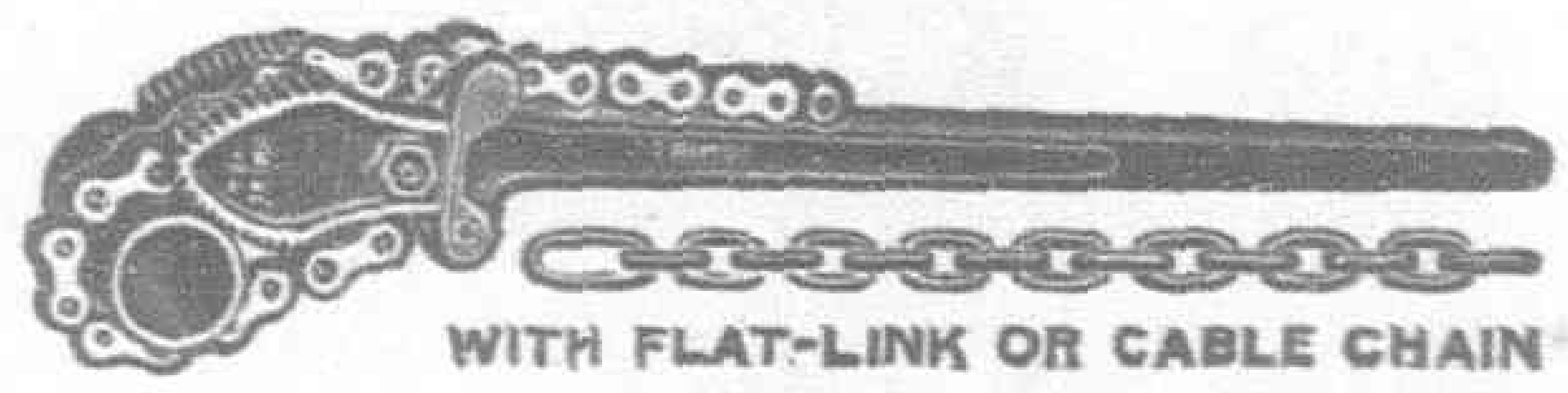

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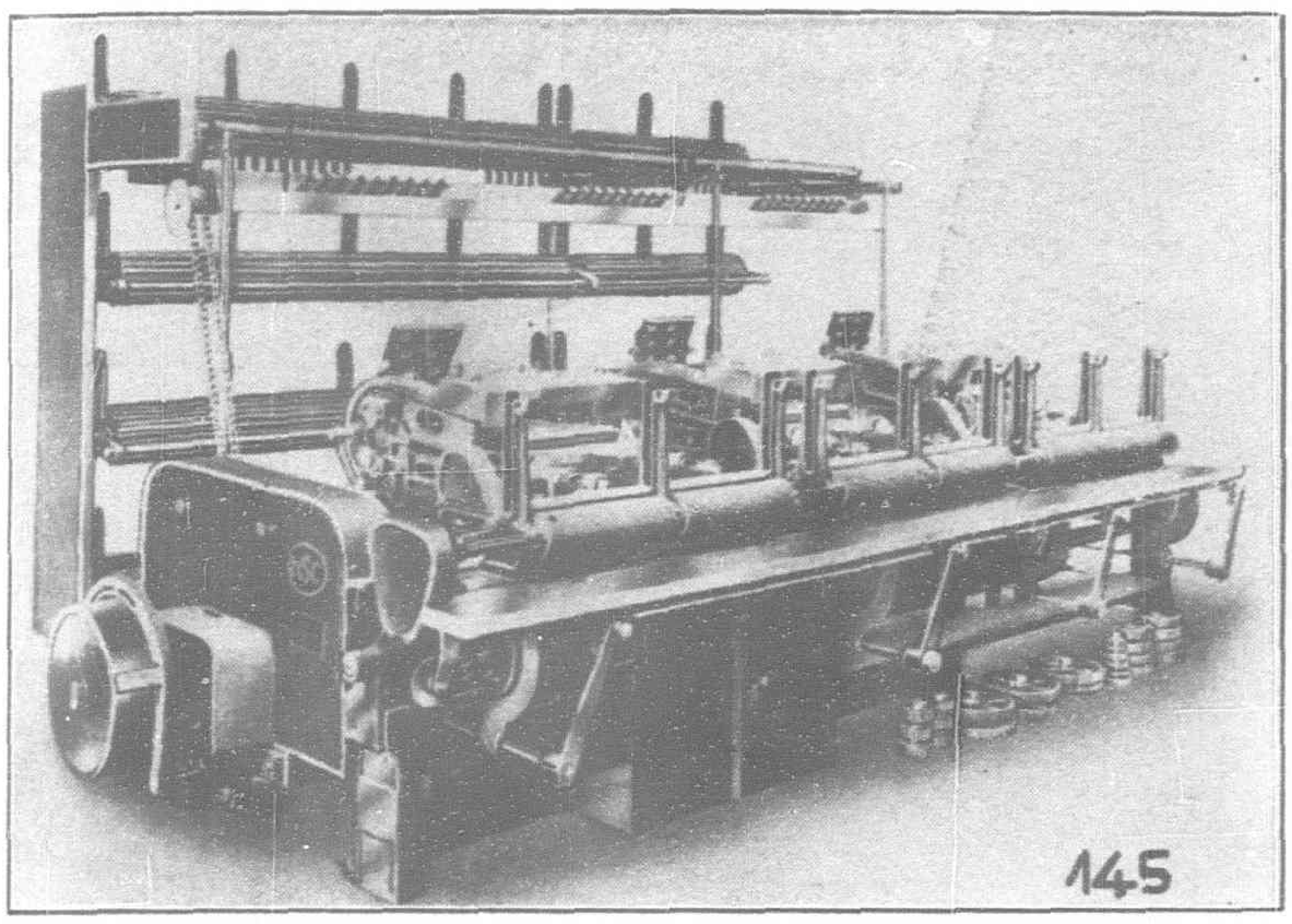

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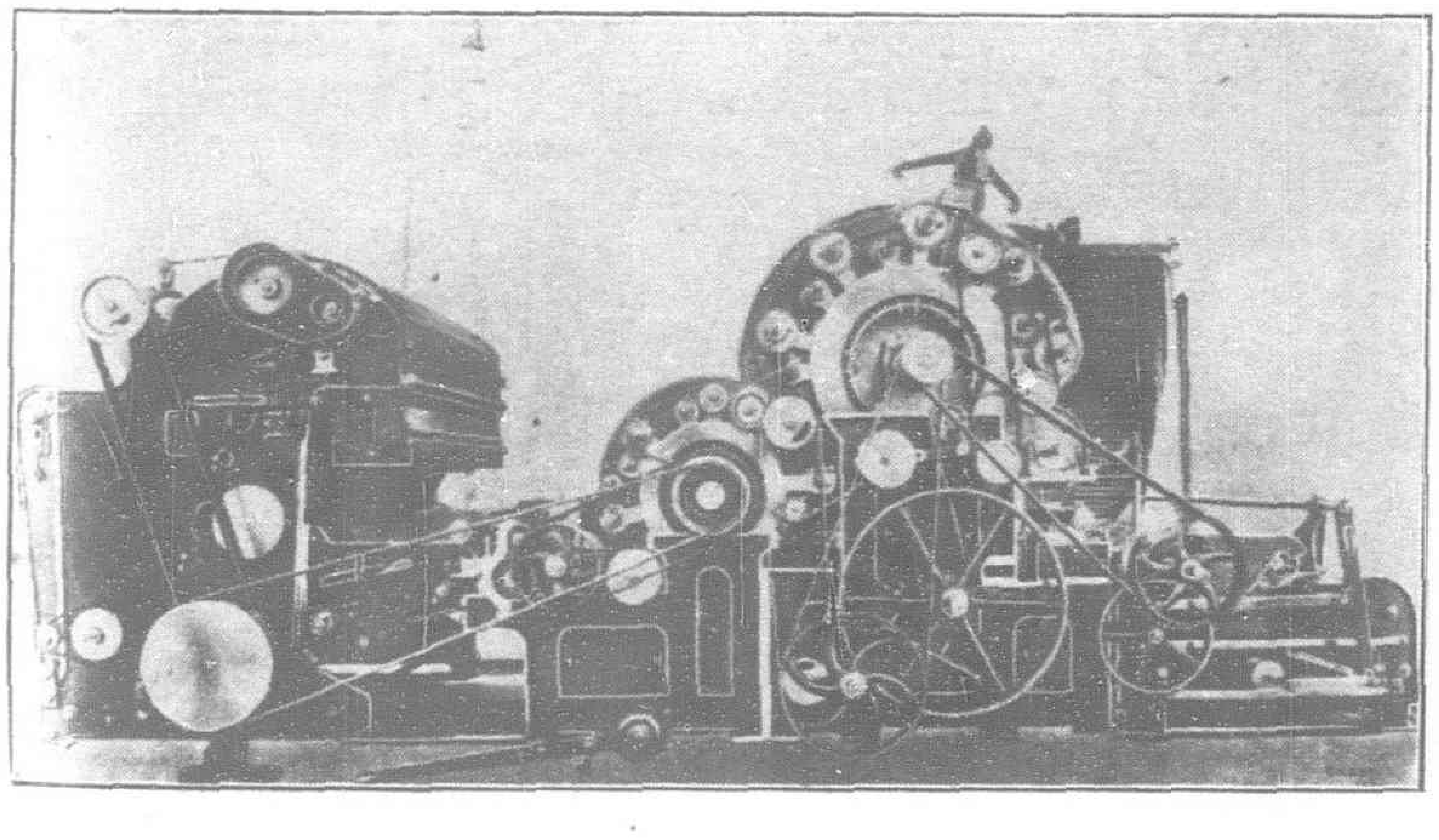

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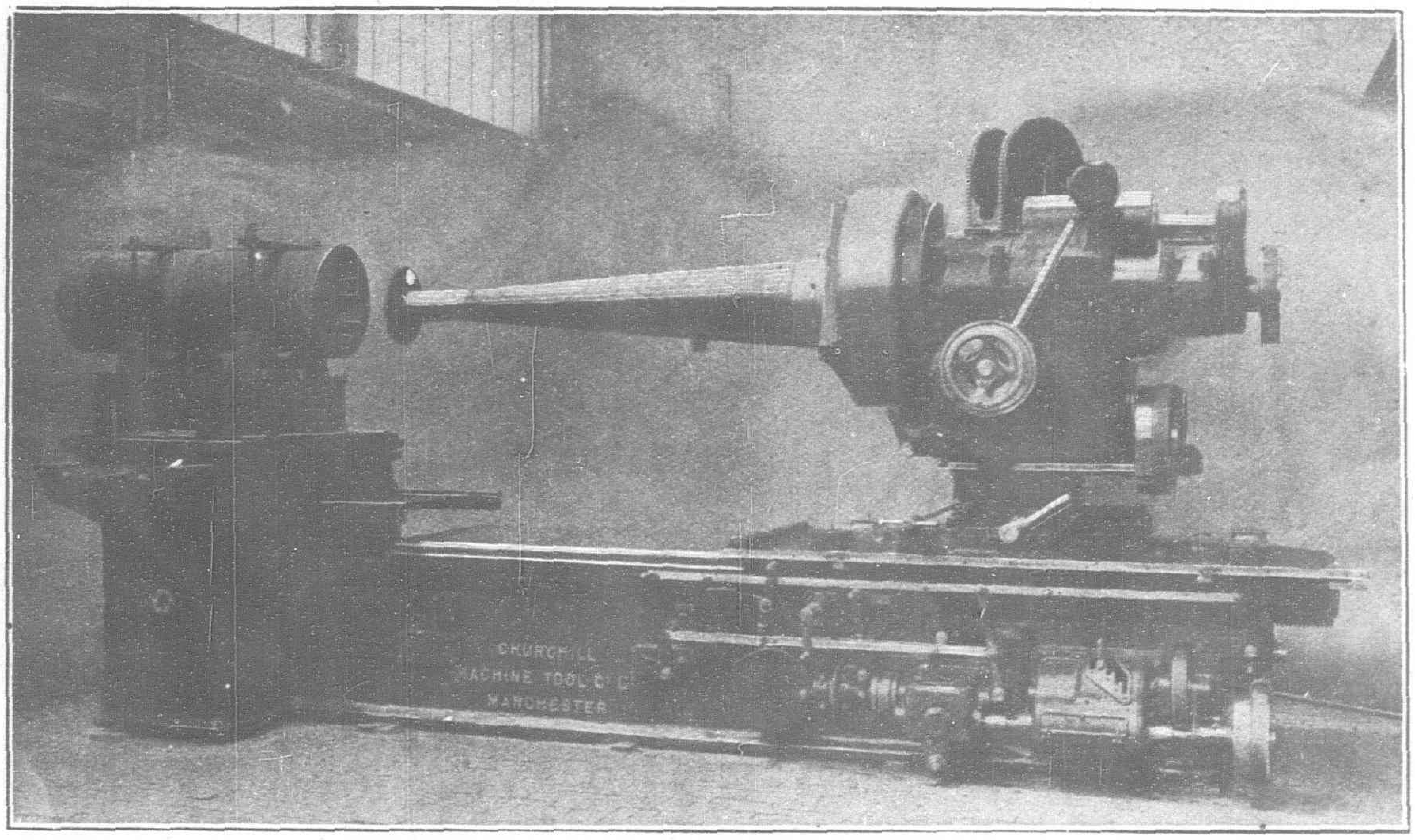

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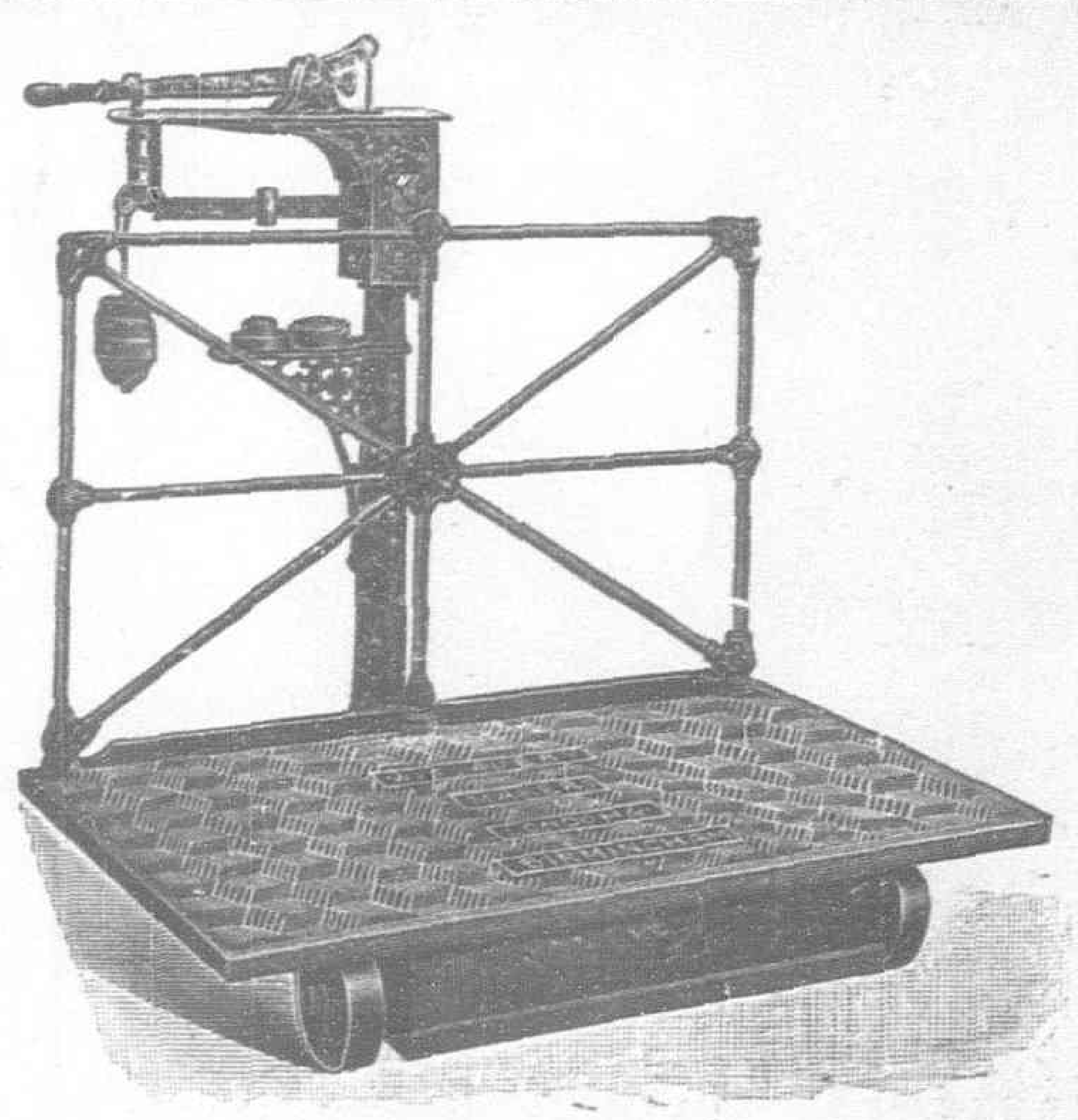

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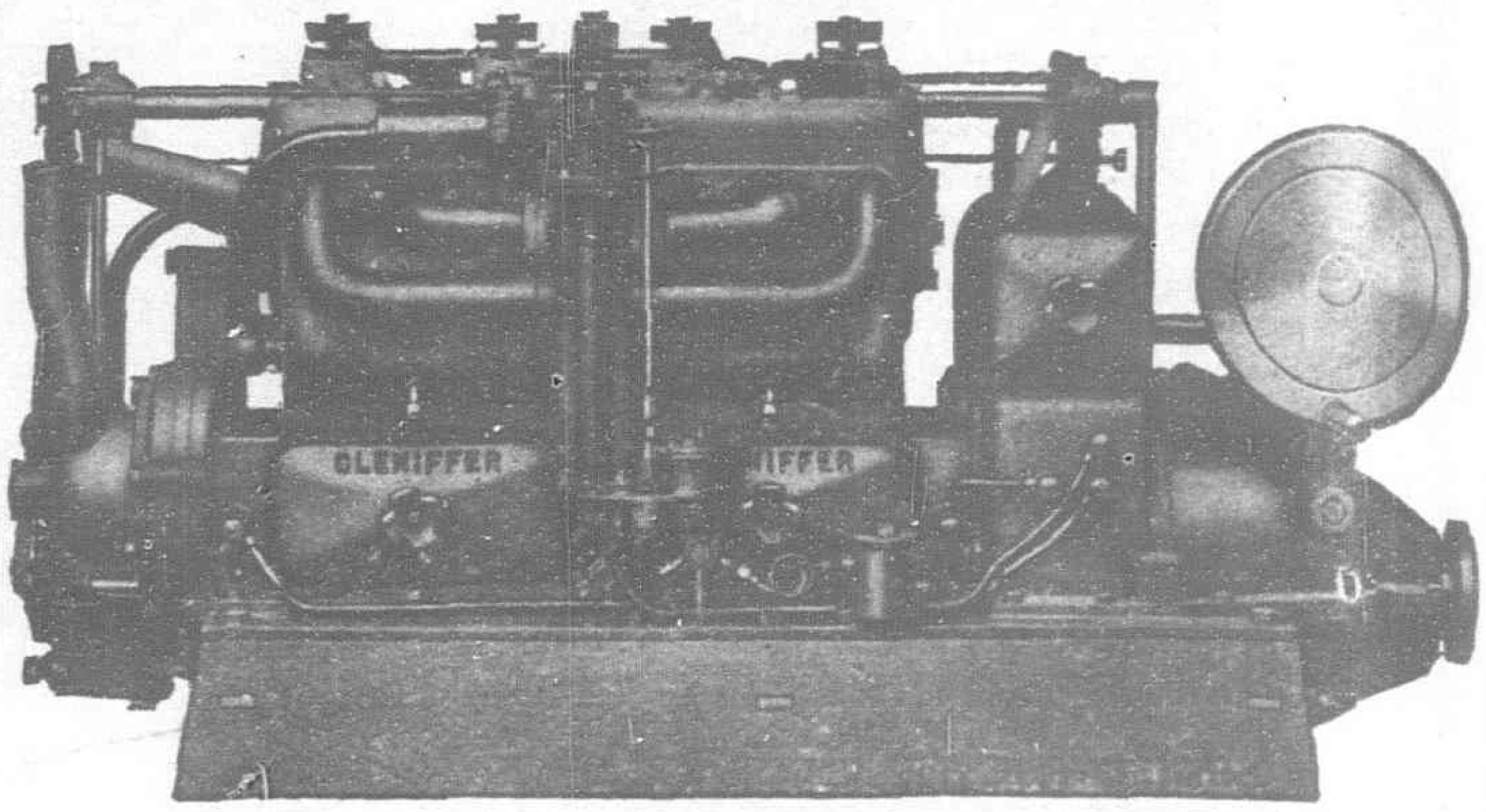

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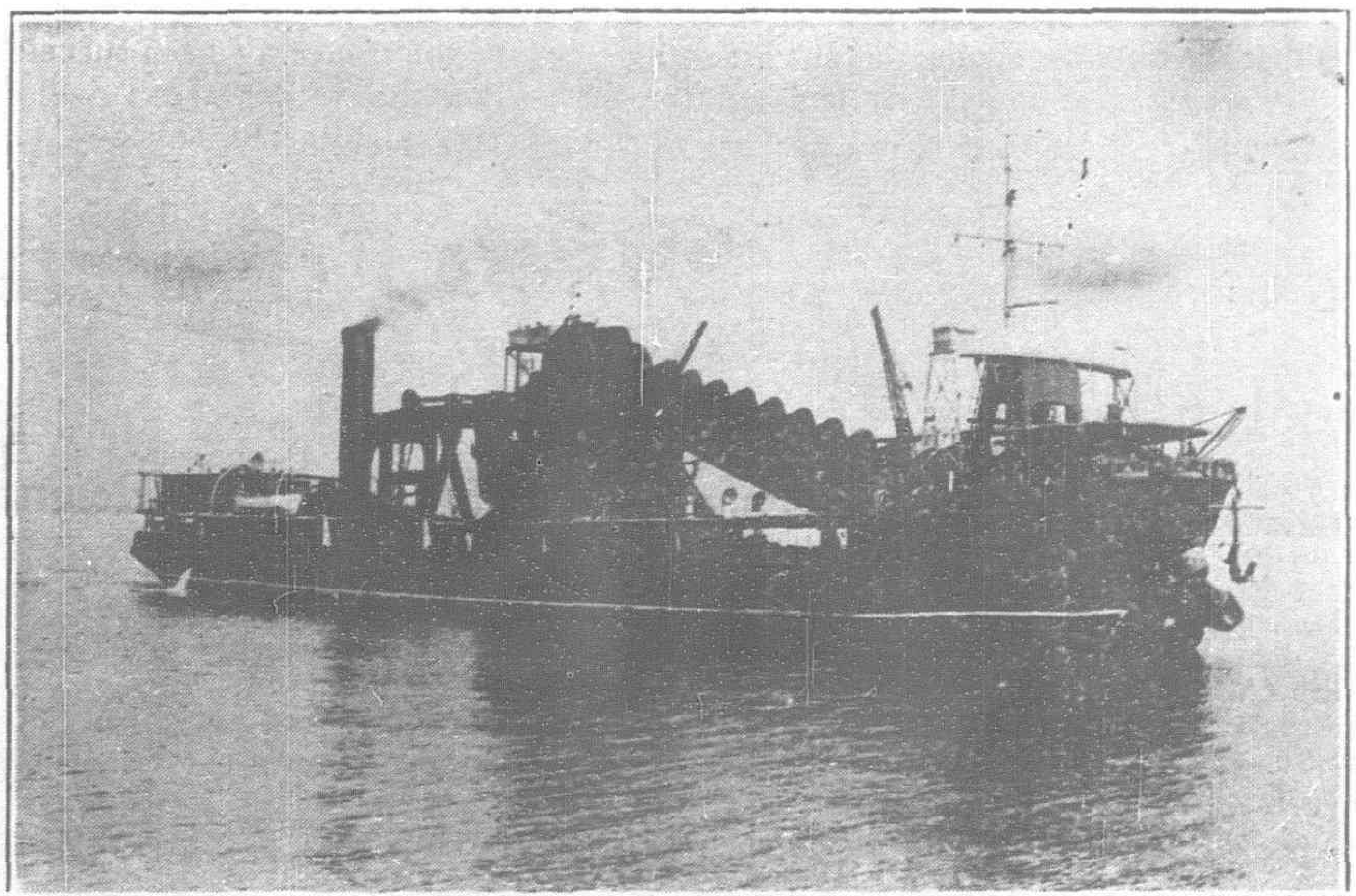

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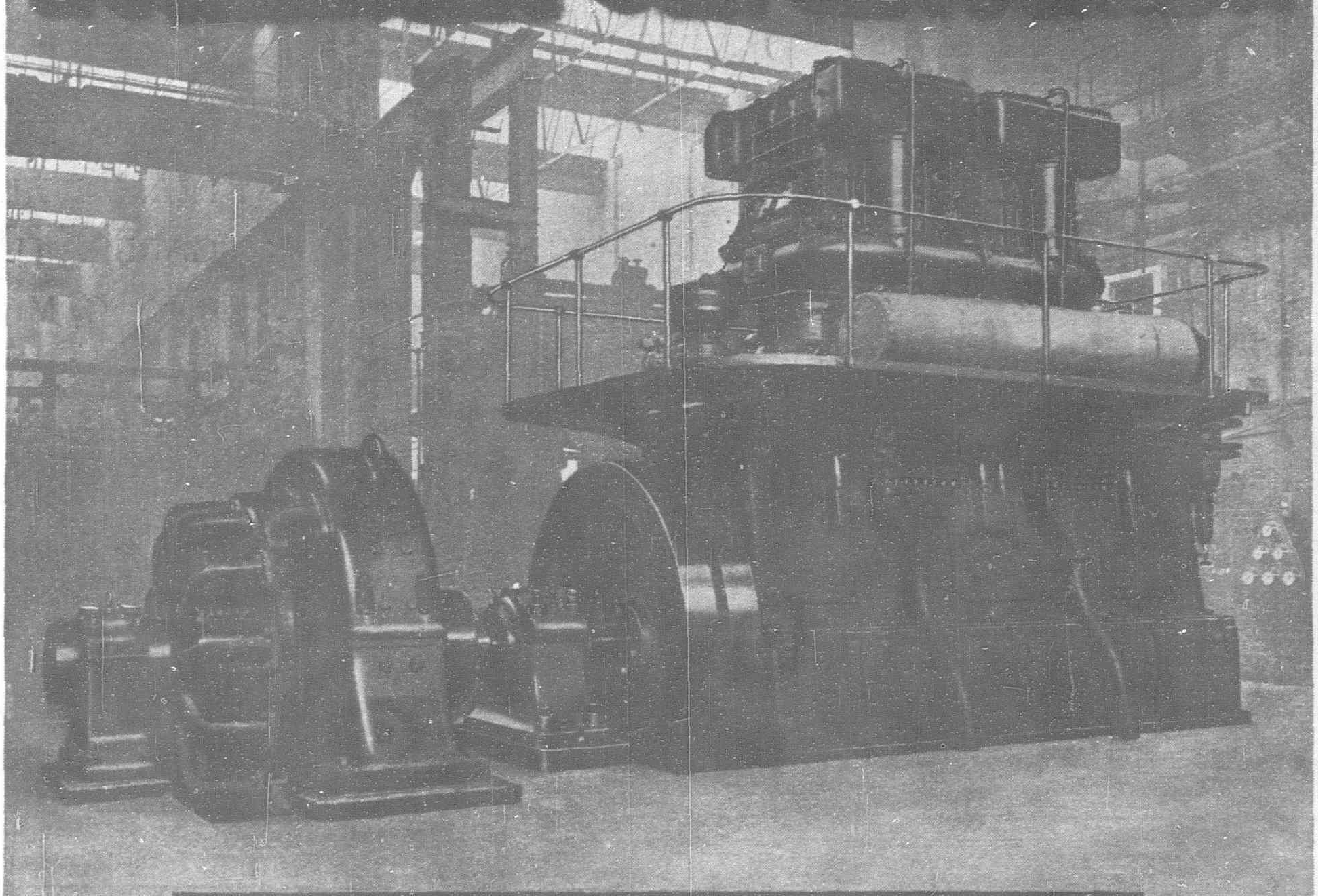

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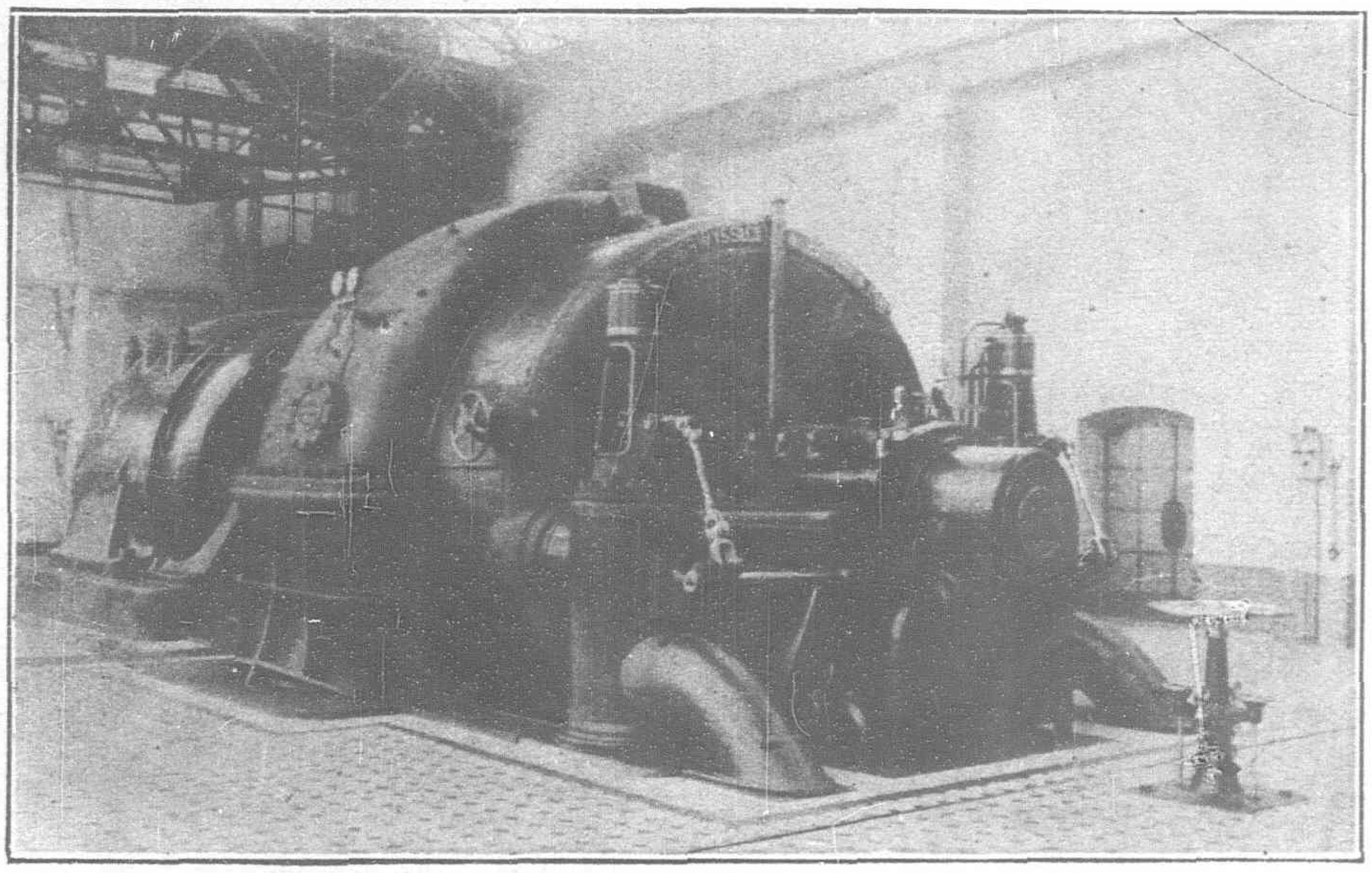

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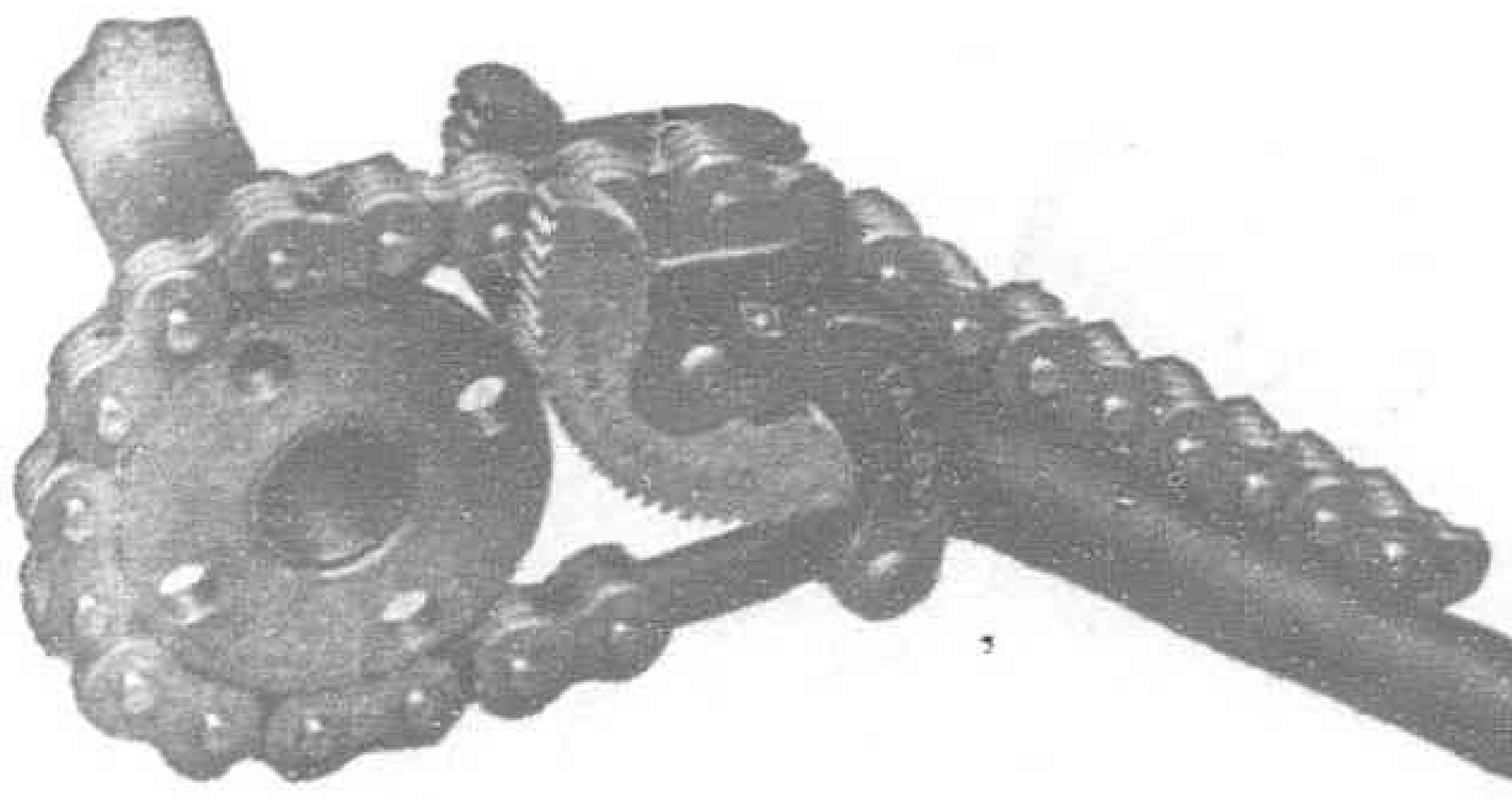

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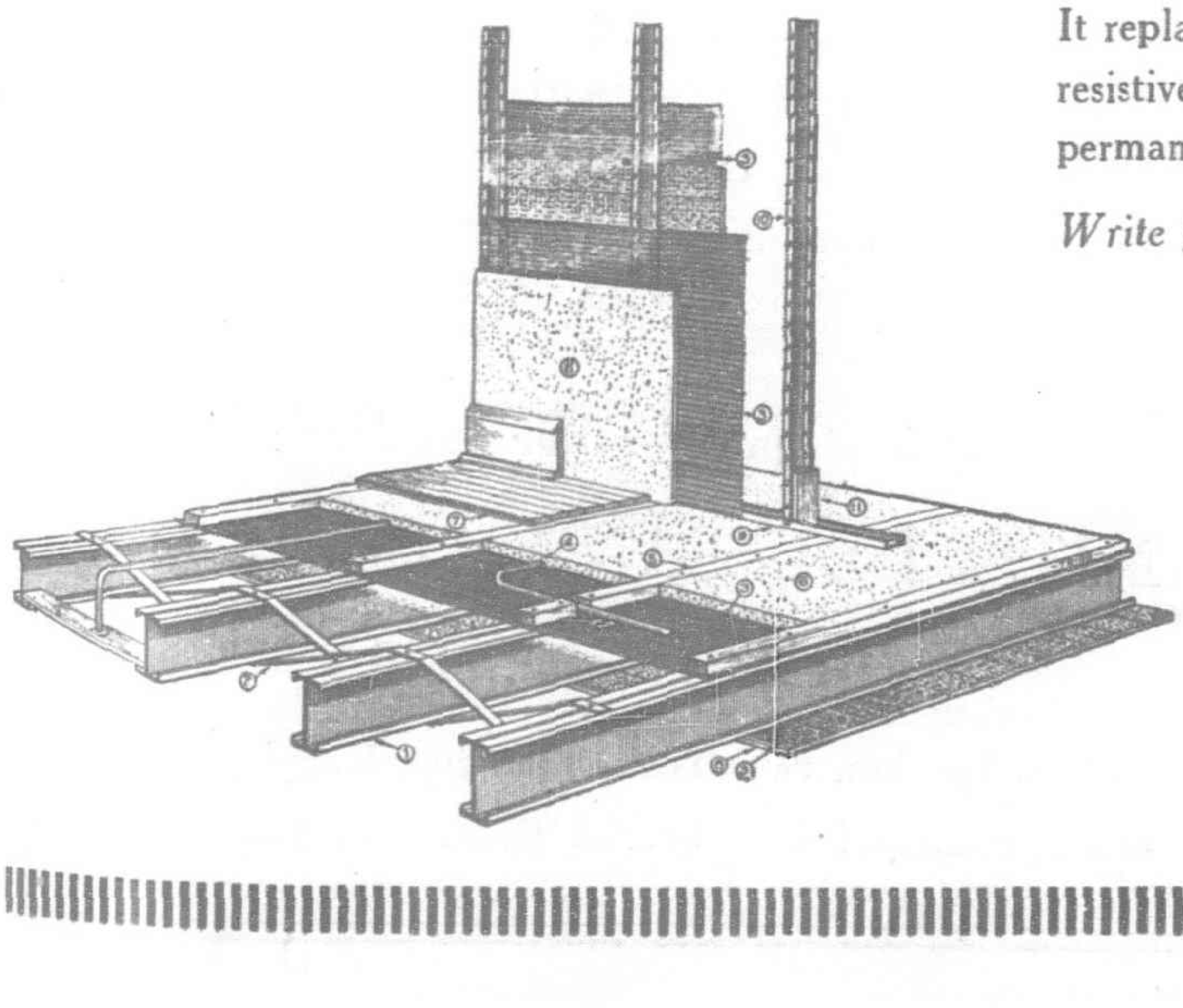

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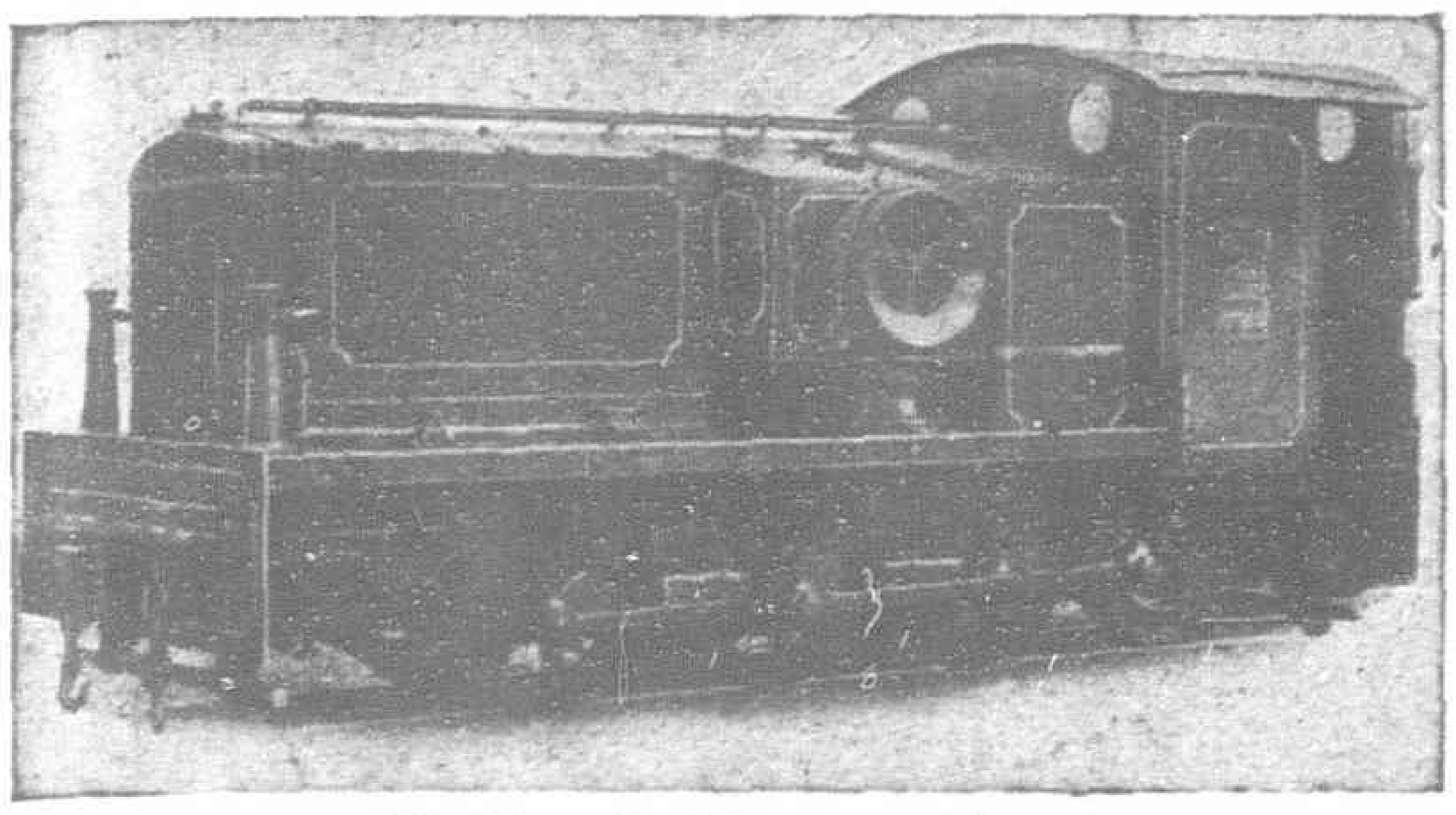

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McEWAN PRATT & CO., LTD.

River Plate House, South Place, London, E.C.2.

Works : BURTON-ON-TRENT, ENGLAND

Telegrams: "EFFERVESCE LONDON"

RAILWAY MOTOR CARS

COACHES

TRAMCARS

ETC.

Contractors to the Admiralty, The War Office, India Office, Crown Agents for the Colonies.

SUPERHEATERS

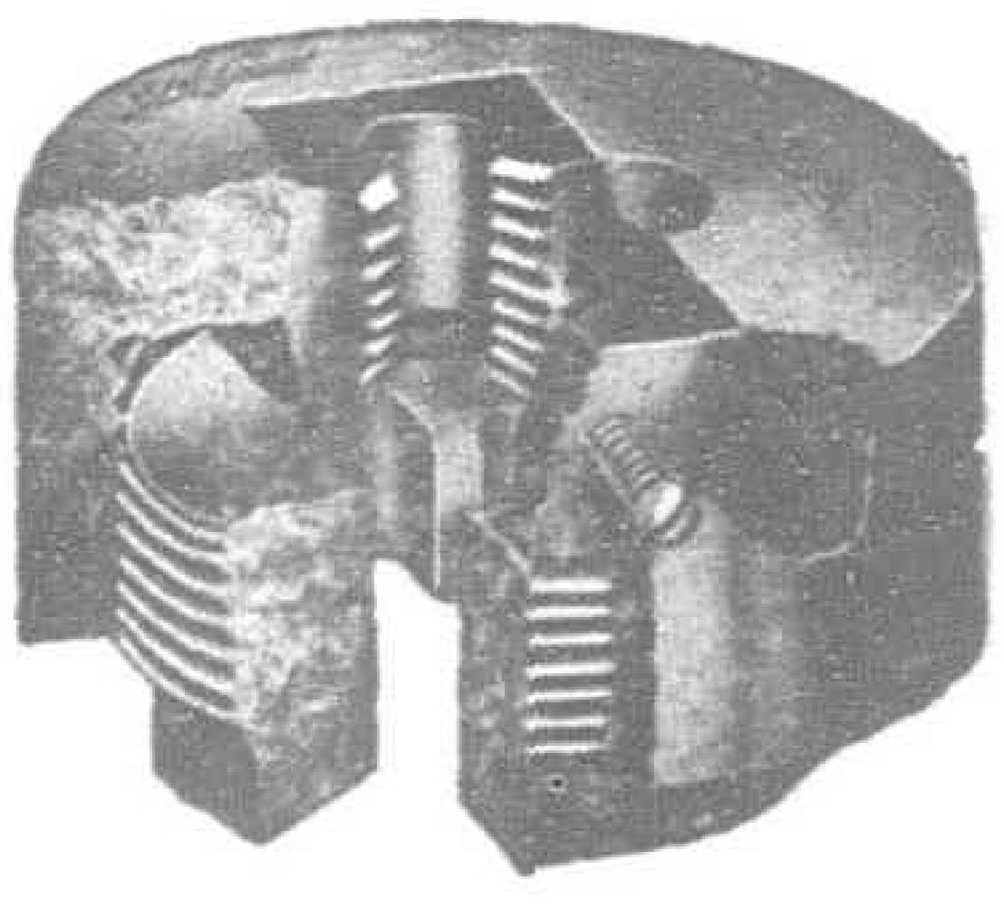
ELESCO

STEAM SUPERHEATERS for Locomotive, Industrial and Marine Service
Feed Water Heater Equipment for Locomotives
Boiler Feed Pumps Pipe Coils
Designing Engineers and Manufacturers

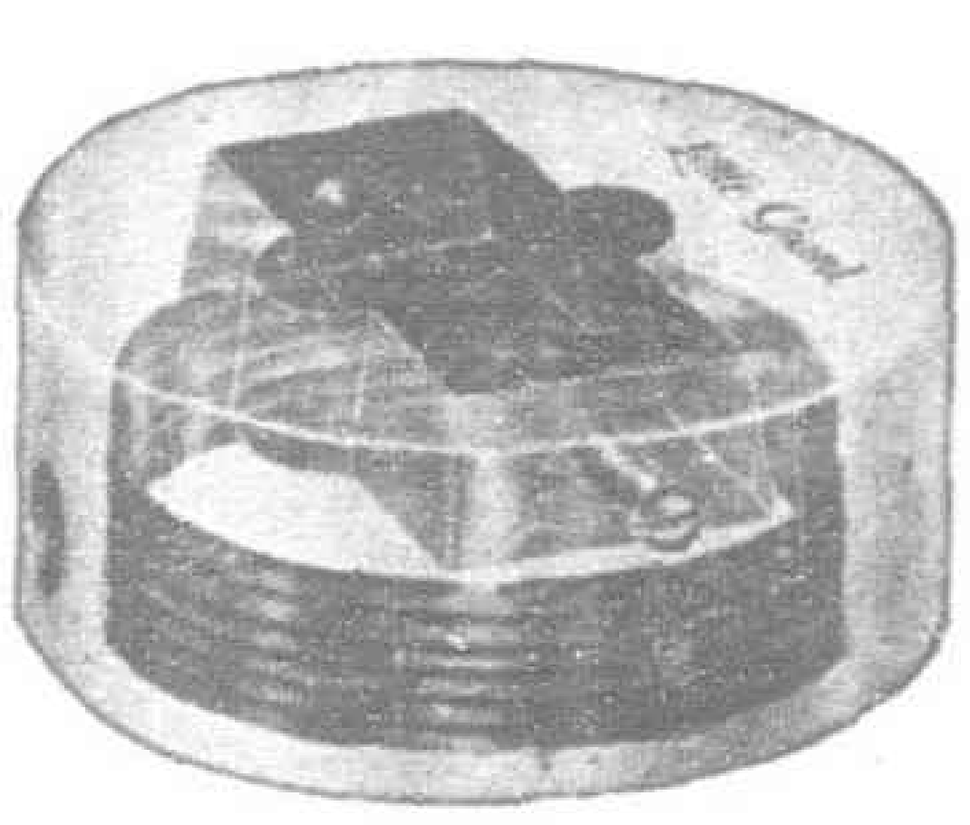
THE SUPERHEATER COMPANY

General Offices: 17 East 42nd St., New York, U.S.A.

***Little Giant* Screw Plates**

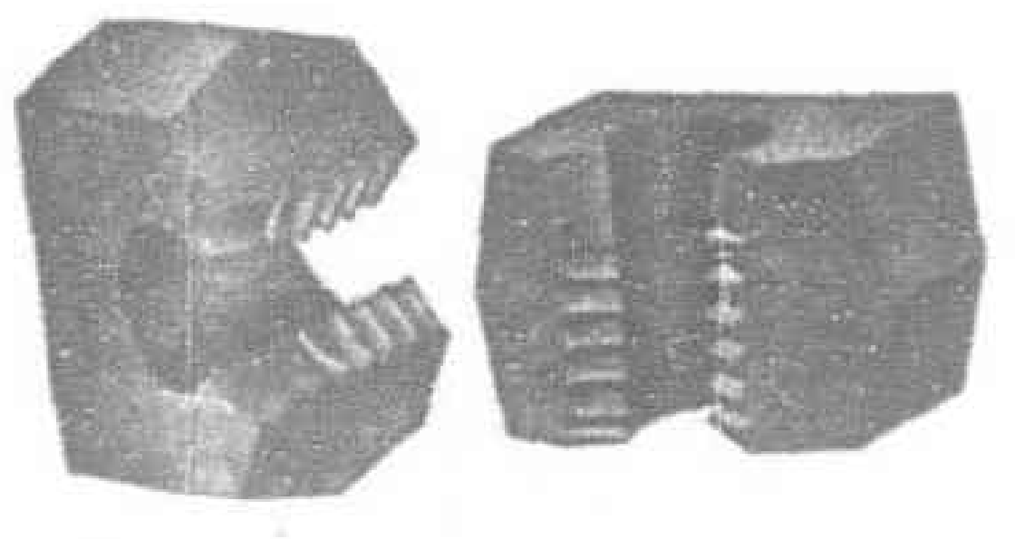


Collet Complete



Cap

Guide

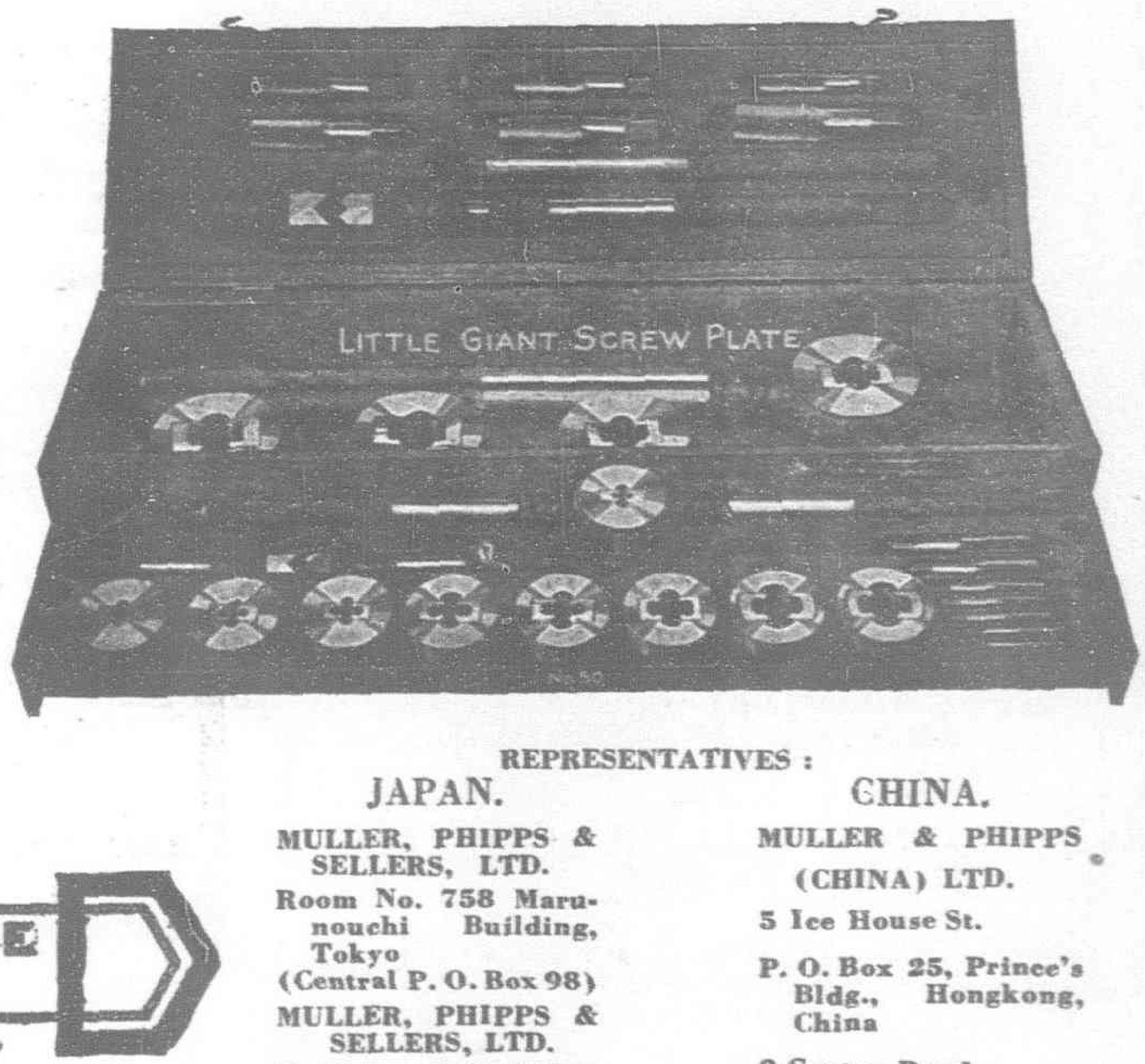


"Little Giant" Die

For 40 years "*Little Giant*" Screwing Tackle has been known and sold all over the world. "*Little Giant*" is the sign of quality wherever screw plates are used.

We manufacture hundreds of different assortments to fit every need. Cutting sizes range from $\frac{1}{16}$ inch to $1\frac{1}{2}$ inch. We furnish Whitworth or United States Standard threads as may be desired.

For detailed information we respectfully refer you to our representatives, whose names are given below.



GREENFIELD TAP AND DIE CORPORATION
GREENFIELD, MASS., U.S.A.

London Office: 139 *Queen Victoria St.*

Greenfield Tap & Die Corporation of Canada, Ltd., Galt. Ont.

GTD Screw Plates, Taps, Dies, Reamers, Gages, Pipe Tools, Twist Drills, Milling Cutters

REPRESENTATIVES :

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MULLER, PHIPPS & SELLERS, LTD.
Room No. 758 Marunouchi Building,
Tokyo
(Central P. O. Box 98)

MULLER, PHIPPS & SELLERS, LTD.
Dojima Building,
Osaka
(Central P. O. Box 63)

HORNE COMPANY LTD.
6-7 Takayama-cho
Kyobashi-Ku
Tokyo, Japan

CHINA.

MULLER & PHIPPS (CHINA) LTD.
5 Ice House St.

P. O. Box 25, Prince's Bldg., Hongkong, China

2 Canton Road
Shanghai, China

The Green Island Cement Co., Ltd.

SHEWAN, TOMES & CO.,
GENERAL MANAGERS, HONGKONG

Are You Going to Build?

Insist on your Architect specifying the use of the best brand of Portland cement in construction. If the house or factory is to be blocks or tiles, they should be of concrete, if stucco, only the best cement should be employed; if reinforced concrete is used, only a standard cement will stand the test; if your building is to be fireproof, waterproof, safe against earthquake or typhoon, improving with age, and lowering the cost of insurance, you must employ concrete, and the best concrete construction is only secured through the use of

Green Island Cement

Green Island Cement is supplied in Bags = 250-lbs. net, Casks = 375-lbs. net, Iron Drums = 375-lbs. net.

Also, Glazed Stoneware, House Drains, Sewer Pipes and Fittings, Paving Bricks, Tiles, Fire Bricks and Fire Clay.

The Green Island Brand has become the standard Portland Cement of Asia, owing to its purity, uniformity and tests.

Used by H.B.M.'s Government in Hongkong, United States Government in the Philippines for all important Public Works.

Also by H.B.M.'s Government in Singapore and Federated Malay States for Government Buildings, Railways and Harbour Works.

Established 1883 Telegraphic Address "ROPEWORK," HONGKONG

THE HONGKONG ROPE MANUFACTURING Co., Ltd.

Manufacturers of Pure Manila Hemp Rope

Rope supplied to the British Navy on the China Station and to all Mail and regular Steamship Lines.

THE PHŒNIX CHOP

Ropes, Cables and Hawsers ½-in. to 15-in. Circumference. Driving Ropes for Mills; Bull Ropes and Drilling Cables for Oil Wells a Specialty.

SHEWAN, TOMES & CO.

General Managers

St. George's Building HONGKONG

CONDENSITE
CELORON

FOR

RADIO PANELS

Radio instruments should be mounted on panels or bases which insulate as nearly perfect as possible.

Celoron is an ideal material for radio panels. It is strong, hard, and waterproof with a high degree of surface and volume resistivity, high dielectric strength and low dielectric losses. It has been approved by the United States Signal Corps.

Celoron may be easily sawed, drilled, turned, tapped or milled and will admit of sharp, clean cut engraving. The finished Celoron is smooth and hard. A lustrous black in color, it adds much to the attractive appearance of any radio set. Mount your instruments on Celoron.

Write for samples and prices.

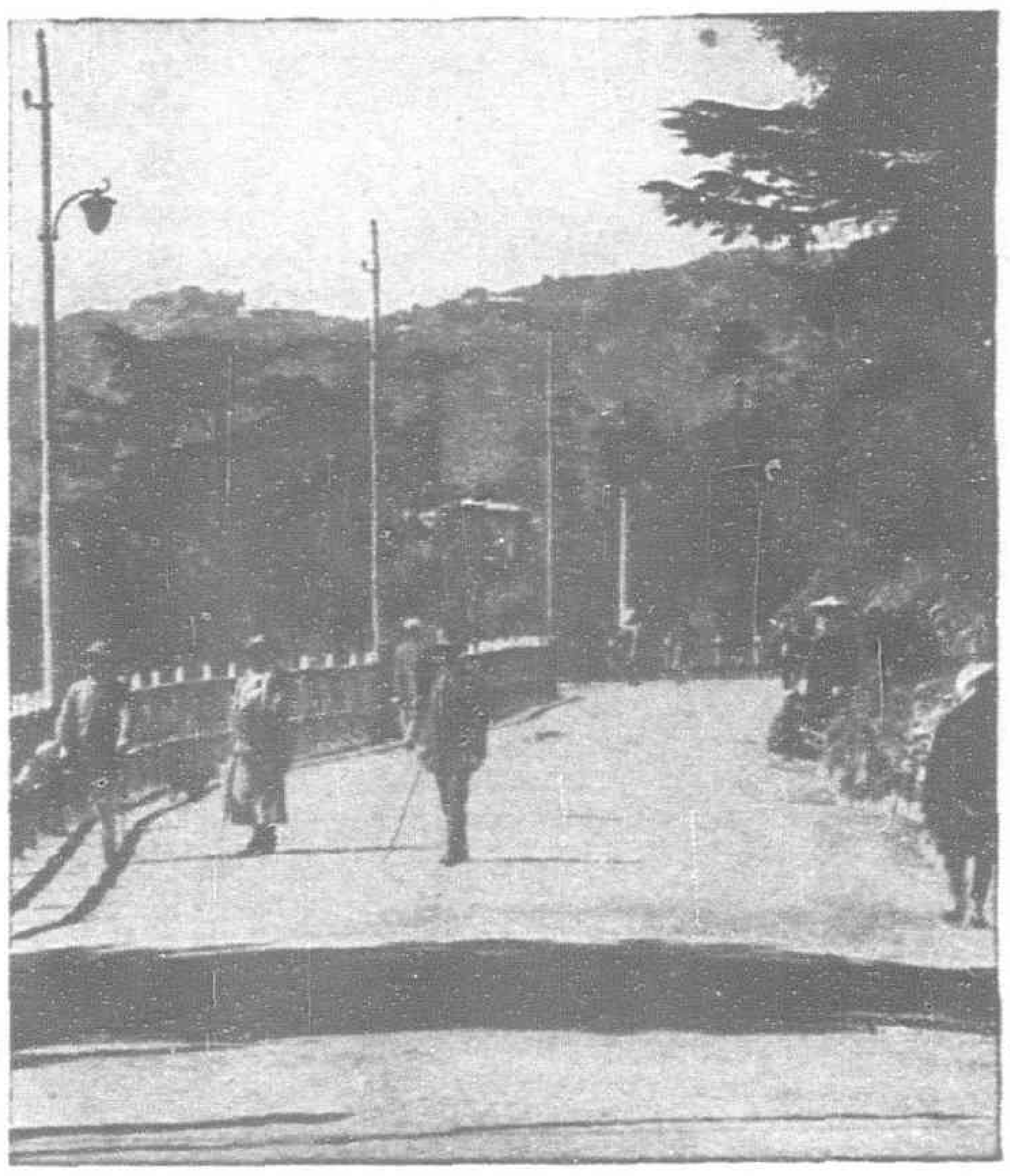
Diamond State Fibre Company
Bridgeport, Pa. (near Philadelphia), U.S.A.
Cable Address: "DYMNFYBR." Norristown

Representative:
AMERICAN TRADING COMPANY

China:
Shanghai
Tientsin, Peking.

Japan:
Tokyo
Kobe

Diamond State Fibre Company
Bridgeport, Pa. Near Philadelphia U.S.A.
Cablegrams "DYMNFYBR", Norristown



WELDLESS STEEL

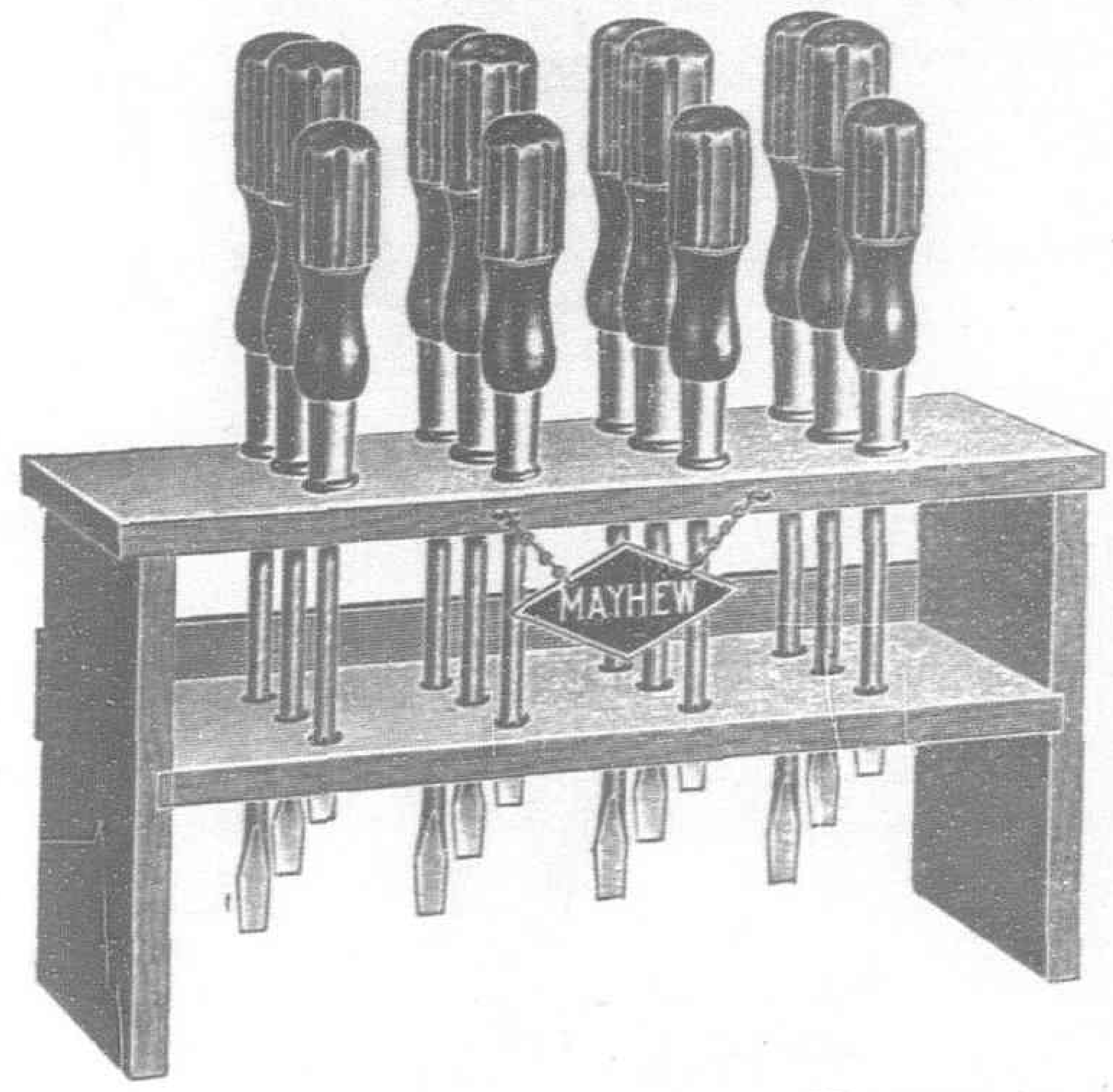
Boiler Tubes for Land and Marine Work.
Lighting and Transmission Poles.
Spigot and Faucet and Flanged Tubes for Gas, Water, Air, etc.
Drive, Casing, Oil Line and Upset Rotary Drill Piping.
Davits, Derricks, Bollards and Deck Pillars, and all other classes of Tubing.

THE BRITISH MANNESMANN TUBE CO., LTD.
67 Queen Victoria Street, E.C. 4

Sole Agents for Federated Malay States & Straits Settlements:
The Borneo Co., Ltd.
No Agency Representation in China, Japan, & Dutch East Indies

TOOLS THAT ENDURE

On the market for 68 years



MAYHEW No. 509—12
SCREW DRIVER
ASSORTMENT

A VERY good selling assortment, consisting of twelve Mayhew Screwdrivers mounted on an attractive wooden Display Stand. These screwdrivers have forged spring steel blades with black finished hardwood handles and are furnished in the assortment in the following blade lengths:—

Four 4 Inch Four 5 Inch Four 6 Inch

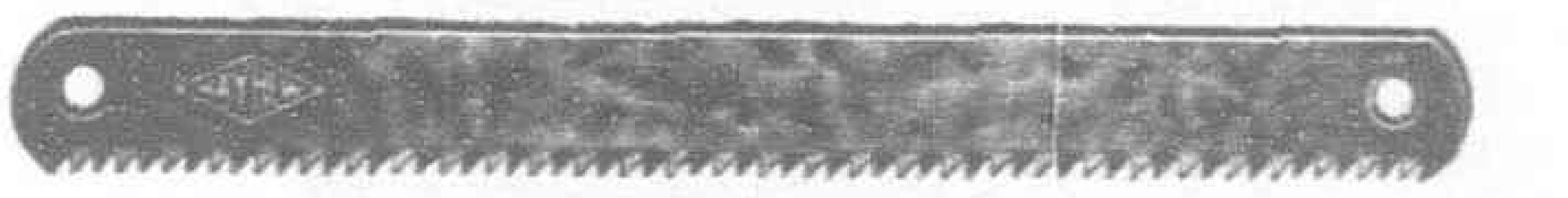
List Price for Assortment with Display Stand (packed in a Heavy Fibre Carton—Easy for You To Ship) $4.00.

No. 509: List Prices per Dozen for the same Screw Drivers Separately.

2 Inch	$3.00	5 Inch	$3.70	8 Inch	$5.00
3 ,,	3.15	6 ,,	3.90	10 ,,	5.80
4 ,,	3.30	7 ,,	4.25	12 ,,	6.75

List Prices Are Subject To Liberal Trade Discounts

MAYHEW HIGH SPEED *TUNGSTEN* HACK SAWS



MAYHEW saws are manufactured of the finest material by the most improved process, and by men who are experts in this field. Improved methods of hardening, and tempering, by which each blade receives individual treatment under exactly the same conditions, assures absolute uniformity. Flexible blades made under this method are unequalled for hand use.

We Suggest The Selection of Hand Blades As Follows:

For Soft Steel, Solids and Rails.. ..	14 Teeth per Inch
* For Hard Steel, Medium Pipe and General Use	18 ,, ,,
For Drill Rod, Brass, Light Pipe, etc...	24 ,, ,,
For Thin Tubing, Thin Sheet Metal, Small Conduit, etc.	32 ,, ,,

* Furnished on orders where Teeth Not Specified

List Prices are Subject To Liberal Trade Discounts

MAYHEW HACK SAWS FOR HAND FRAMES

Specify Hard or Flexible

Length	Width	Thickness	Teeth per Inch	List Price Gross
8	½	.025 or 23 ga	16,18,24,32	$8.00
9	½	.025 or 23 ga	16,18,24,32	9.00
10	½	.025 or 23 ga	14,18,24,32	10.00
11	½	.025 or 23 ga	14,16,18,24,32	11.00
12	½	.025 or 23 ga	14,18,24,32	12.00

Also Manufacturers of Awls, Bit Extensions, Bits, Chisels, Counter Sinks, Drills, Gimlets, Hack Saws, Ice Picks, Pliers, Punches, Reamers, Screw Drivers, etc.

Open To Propositions From Reputable Houses To Establish Agencies

MAYHEW STEEL PRODUCTS, INC.
291 BROADWAY, NEW YORK, N.Y., U.S.A.
CABLE ADDRESS, MAYHEWTOOL ALL CODES

NOBEL

ELECTRIC ARC WELDING

THE PREMIER ELECTRIC WELDING CO. LTD. have recently introduced several types of Electric Arc Welding equipment on entirely new lines, with the object of providing the highest possible electric efficiency combined with low cost and reliability. The attention of Engineers, Shipbuilders and others is drawn to the following.

MULTIPLE ARC WELDING PLANT
For two or more operators. Wasteful excess voltage avoided.

SINGLE OPERATOR DIRECT CURRENT MACHINE
with the Company's Standard 4·4 k.w. Engine-driven Set.

"PREMIER" ELECTRODES
Flux-coated type. Do not leave layer of slag requiring chipping.

DISTANCE CONTROL APPARATUS
Enabling the operator to control the current supply from the actual job.

The Company also undertake to carry out Welding Repairs and construction work.
Prompt attention given to all enquiries.
Ask for Leaflet: "An Impromptu Repair at Sea."

THE
PREMIER ELECTRIC WELDING
Company Limited
(PROPRIETORS: NOBEL INDUSTRIES LIMITED)
Head Office and Works: ABBEY WOOD, LONDON, S.E.2
AND AT
LIVERPOOL · NEWCASTLE · GLASGOW · LEITH · BELFAST · SWANSEA
SHEFFIELD · STOKE · GRIMSBY

UNITED STATES STEEL PRODUCTS COMPANY

30 Church St., New York, U.S.A.

Sole Exporters of the Products of

- Carnegie Steel Company
- Illinois Steel Company
- American Steel & Wire Company
- American Sheet & Tin Plate Company
- The Lorain Steel Company
- American Bridge Company
- National Tube Company
- Tennessee Coal, Iron & Railroad Company
- Minnesota Steel Company
- Canadian Steel Corporation

BRANCH OFFICES and REPRESENTATIVES IN

- Antwerp, Belgium
- Birmingham, England
- Bombay, India
- Brussels, Belgium
- Buenos Aires, Argentine Republic
- Calcutta, India
- Concepcion, Chile
- Durban, South Africa
- Glasgow, Scotland
- Havana, Cuba
- Lima, Peru
- Los Angeles, California
- London, England
- Mexico City, Mexico
- Montreal, Canada
- New Glasgow, Canada
- New Orleans, La
- Peking, China
- Port Elizabeth, South Africa
- Portland, Oregon
- Rio de Janeiro, Brazil
- Rome, Italy
- San Francisco, California
- San Juan, Porto Rico
- Santiago, Chile
- Sao Paulo, Brazil
- Seattle, Washington
- Shanghai, China
- Soerabaya, Java
- Sydney, New South Wales
- The Hague, Holland
- Tokio, Japan
- Toronto, Canada
- Valparaiso, Chile
- Vancouver, Canada
- Winnipeg, Canada

WAREHOUSES AT

- Antwerp, Belgium
- Bombay, India
- Buenos Aires, Argentine Republic
- Calcutta, India
- Callao, Peru
- Capetown, South Africa
- San Francisco, California
- Santiago, Chile
- Sao Paulo, Brazil
- Talcahuano, Chile
- Valparaiso, Chile

We give prompt attention to inquiries for all classes of our Steel Products, including the following :—

- AERIAL TRAMWAYS—Reversible, specially designed
- ALLOY STEEL
- ALLOY STEEL SHEETS
- AMMONIA CYLINDERS
- ANGLES
- ARMATURE SHEETS
- AXLES—Locomotive, Railroad and Tramway Cars
- BAMBOO STEEL
- BARBED WIRE
- BARS—Merchant and Concrete Reinforcement, plain, deformed and cold twisted
- BILLETS
- BLACK SHEETS
- BLOOMS
- BOILER TUBES, Lapwelded and Seamless
- BOLTS AND NUTS
- BRIDGES—Railway, Highway, specially designed
- BUILDINGS—Steel Warehouses, Structural Steel for Buildings
- CABLES—Steel Hoisting and Haulage Cables
- CARS—Steam Railway, Mine and Industrial Railway Cars
- CAR ANGLES
- CAR WHEELS
- CHANNELS
- COLD ROLLED FLAT WIRE
- COPPER RAIL BONDS
- COPPER BEARING STEEL SHEETS
- DERRICKS
- DRILLING MACHINES
- DRILLING RIGS FOR OIL WELLS
- DUQUESNE RAIL JOINTS
- ELECTRICAL SHEETS
- ELECTRICAL WIRES AND CABLES—Bare and Insulated
- FABRICATED STRUCTURAL MATERIAL FOR BRIDGES, TURNTABLES, STEEL BUILDINGS, ETC.
- FENCING MATERIALS—Wire Fencing, Steel Posts
- FORGINGS
- FROGS AND SWITCHES—Steam and Electric Railways
- HOOPS AND BANDS
- MACHINE FORGINGS
- MINE TIMBERS
- NAILS—Wire
- NAIL RODS
- NAIL WIRE
- PIG IRON
- PILING—Steel Sheet
- PIPE—Black and Galvanized Wrought, for Steam, Gas and Water, American or English Threads; Lapwelded Boiler Tubes, Matheson Lead Joint Pipe, Seamless Steel Tubing
- PLATES—Boiler, Tank, Ship, Flange and Fire Box Steel
- POLES—Steel Tubular
- RAILS—Light and Heavy Rails for Railways, Tramways, Mine and Industrial Railways. Special Track Work
- REINFORCEMENT FOR CONCRETE—Triangle Wire Mesh
- RIVETS
- ROPE—Wire for Mine Hoists, Derricks, Cranes, etc.
- SCREW SPIKES
- SCREW STOCK—Cold Drawn
- SHAFTING
- SHAPES—Standard Structural
- SHEET BARS
- SHEETS—" Apollo " Brand Galvanized Corrugated and Plain
- SKELP
- SLABS
- SPIKES—Railway Track Spikes
- SLEEPERS—Steel
- SPRING STEEL
- STEAM PIPE AND TUBES
- STOVE PIPE SHEETS
- SWITCHES AND SWITCH STANDS
- TANK PLATES
- TERNE PLATES
- TIN MILL PRODUCTS
- TIN PLATE—" Coke," " Charcoal " and " Terne "
- TOOL STEEL
- TOWERS—Steel
- TRIANGLE MESH CONCRETE REINFORCEMENT
- TUBES—Gas, Water, Steam and Boiler
- TURNTABLES FOR LIGHT AND HEAVY RAILWAY SERVICE
- UPHOLSTERY SPRINGS
- WASHERS
- WEATHERPROOF INSULATED WIRES AND CABLES
- WHEELS—Solid Rolled Steel for Steam, Electric, Mine and Industrial Railways.
- WIRE—Bright, Annealed, Galvanized, Baling and Fencing and all Classes of Coated and Uncoated for Manufacturing Purposes.

The Combined Actual Annual Ingot Production of our Manufacturing Companies for the year 1920 was in excess of 19,000,000 tons.

SHANGHAI OFFICE: Union Building—1 Canton Road
PEKING OFFICE: No. 22 Wu Liang Ta Jen Hutung
TOKYO OFFICE: No. 19 Nakadori, Marunouchi

OKURA & CO. (TRADING) LTD.

No. 2 Canton Road, Shanghai

President :
Baron K. Okura

BRANCHES at Hakodate, Yokosuka, Yokohama, Osaka, Kobe, Maizuru, Kure, Moji, Saseho, Keelung, Taihoku, Seoul, Antung, Penhsihu, Mukden, Tientsin, Peking, Hankow, Changsha, Kiukiang, Tsingtau, Hongkong, Vladivostok, Sydney, San Francisco, New York, London.

Head Office :
Ginza, Tokio

GENERAL IMPORTERS AND EXPORTERS

Rails, Bridges, Locomotives and other Railway Supplies
Electric Plants, Electrical Supplies
Sugar Plants, Spinning Machinery, Machine Tools
Factory Equipments, and all kinds of Machines
Automobiles, Guns and Explosives
Structural Materials, Steel Materials, Metals
Mineral Products, Chinese and Japanese Produce, Silk
Cotton, Wool, and their Manufactures
Fertilizers, Chemicals, Vegetable Oils and Wax, Dye Stuffs
Food Stuffs, Hides and Fur, Skins, Pen-hsi-fu Smokeless Coal and Pig Iron, etc.

BUILDING AND CIVIL ENGINEERING CONTRACTORS,
INSURANCE AGENTS

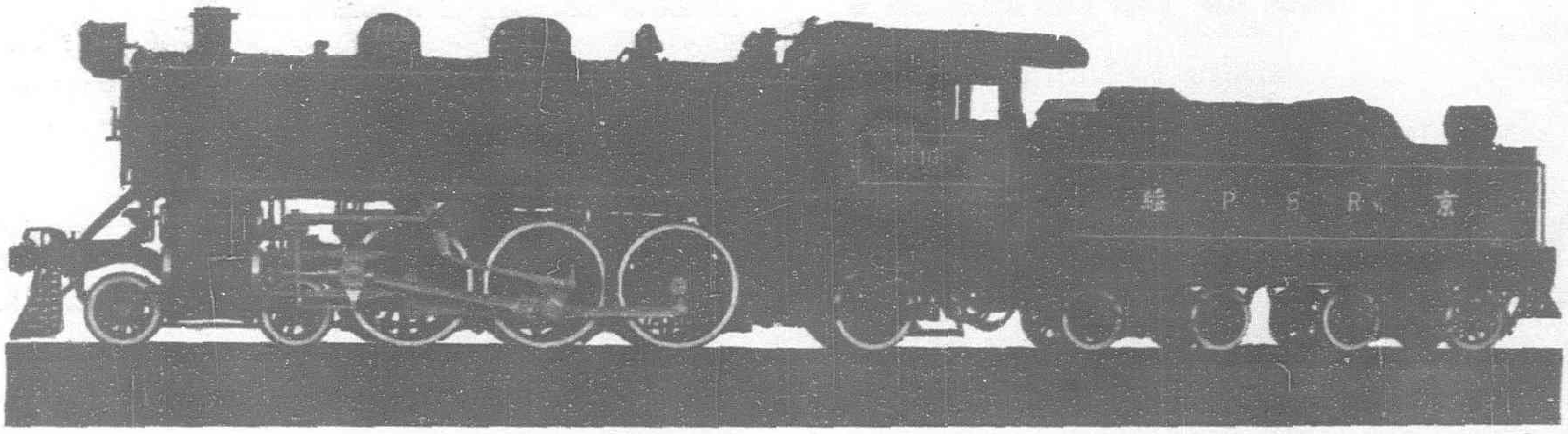
Yih Chong Wharf (Okura)

POOTUNG, SHANGHAI

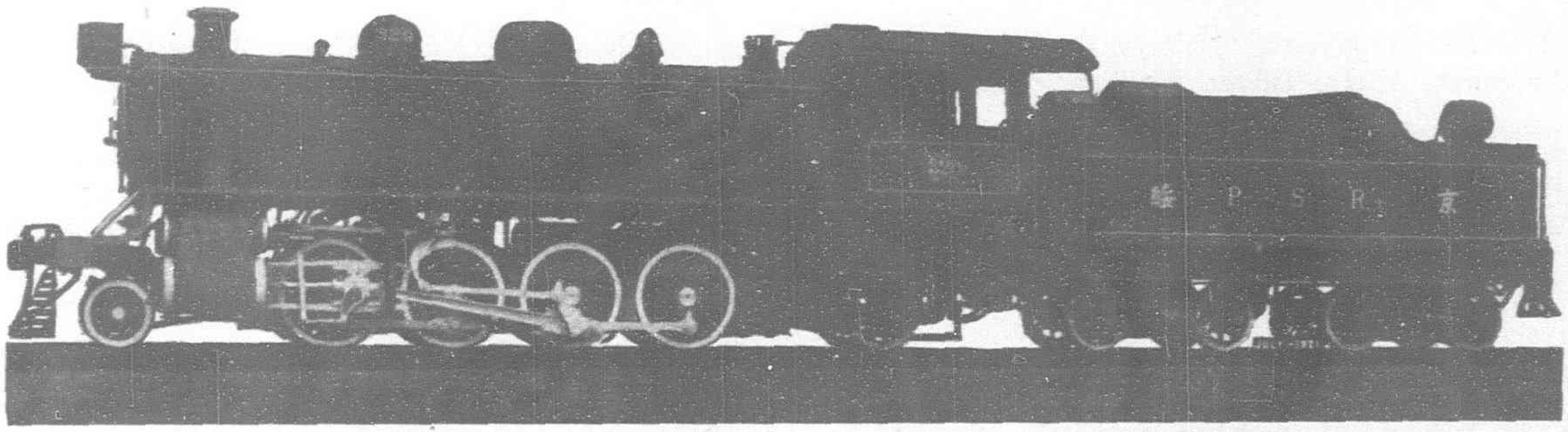
"AMERICAN" LOCOMOTIVES

ON THE

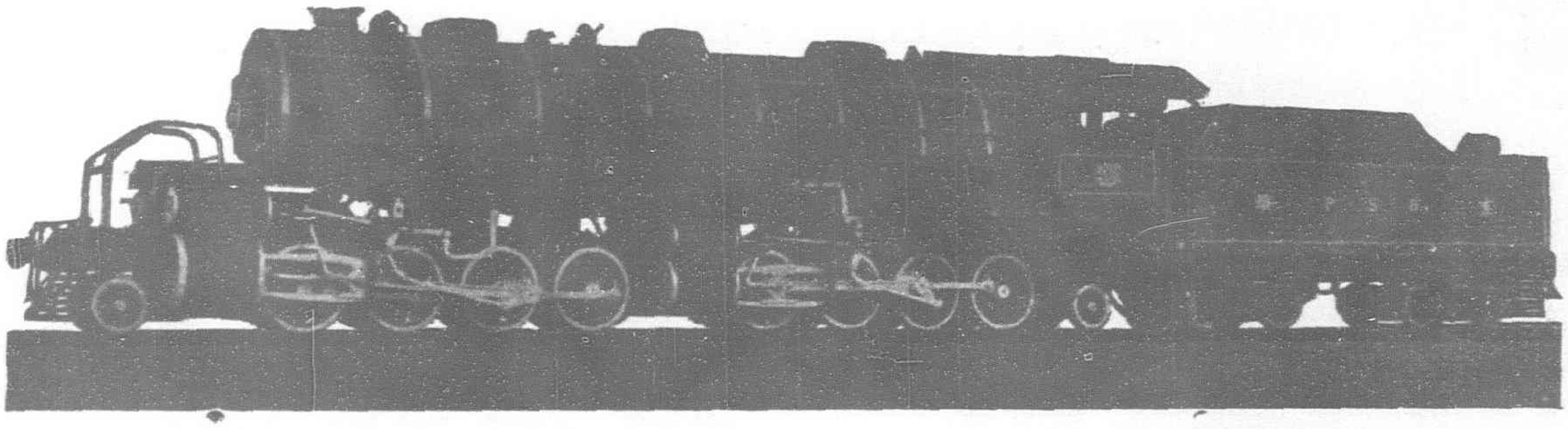
PEKING-SUIYUAN RAILWAY



Total Weight of Engine, 184,500 pounds; Weight on Driving Wheels, 109,500 pounds; Diameter of Driving Wheels, 62 inches; Boiler Pressure, 180 pounds; Cylinders, 20 by 26 inches; Maximum Tractive Power, 25,650 pounds.



Total Weight of Engine, 188,500 pounds; Weight on Driving Wheels, 137,000 pounds; Diameter of Driving Wheels, 50 inches; Boiler Pressure, 180 pounds; Cylinders, 20 by 28 inches; Maximum Tractive Power, 34,300 pounds.



Total Weight of Engine, 446,000 pounds; Weight on Driving Wheels, 388,500 pounds; Diameter of Driving Wheels, 50 inches; Boiler Pressure, 220 pounds; Cylinders, 24 & 38 by 28 inches; Maximum Tractive Power, Compound, 92,500 pounds; Maximum Tractive Power, Simple, 110,000 pounds.

Safety, excellent quality of materials, correct design, good appearance, and perfect workmanship are the features back of "American" locomotives.

These features, coupled with the fact that we have built over 65,000 locomotives should have the earnest consideration of those contemplating the purchase of locomotives.

For further information write to our nearest representative:

AMERICAN LOCOMOTIVE SALES CORPORATION

NEW YORK CITY

Telegraphic Addresses:

Locomotive: Peking, China
Mitsui: Tokio, Japan
Banco: Sydney, Australia
Nottac: Manila, P. I.
Dilpax: Honolulu, Hawaii

MITSUI BUSSAN KAISHA

Cable Address:
"MITSUI"

Capital: Yen 100,000,000
Reserve: „ 30,000,000

LIMITED

MITSUI & CO., LTD. (IN EUROPE AND AMERICA)

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SHIPOWNERS AND SHIPBUILDERS

Head Office: TOKYO, JAPAN

Branches:

HOME—Yokohama, Nagoya, Osaka, Kobe, Otaru, Muroran, Hakodate, Niigata, Moji, Wakamatsu, Kuchinotsu, Nagasaki, Karatsu, Miike, Taipeh, Keelung, Tainan, Takow, etc., etc.

ABROAD—London, Marseilles, Lyon, Hamburg, New York, San Francisco, Seattle, Portland, Ore, Buenos-Aires, Manila, Bombay, Karachi, Calcutta, Singapore, Bangkok, Rangoon, Soerabaya, Batavia, Semarang, Sydney, Melbourne, Hongkong, Canton, Amoy, Foochow, Shanghai, Chefoo, Hankow, Changsha, Newchwang, Tientsin, Dairen, Antunghsien, Mukden, Tieling, Tsingtau, Chungchun, Vladivostok, Harbin, Seoul, Chemulpo, Fusan, etc. etc.

SHIPBUILDERS, ENGINEERS AND REPAIRERS SHIPYARDS AND DRYDOCKS AT TAMA, OKAYMA, JAPAN, For Construction and Repairing

PRINCIPAL LINES OF BUSINESS:

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Raw Silk and Silk Textiles, Coal, Lumber, Rice, Seeds, Beans, Flour, and Other Cereals, Sugar, Copper and other Metals, Vegetable and Wood Oils, Camphor, Matches, Fertilizers, Paper, Canned Foods, Fish Products, Tea, Sulphur, Cement, etc., etc.

IMPORT.

Machinery and Tools, Ships, Steel and Iron, Locomotives, Rails and other R. R. Equipment, Sugar, Rice, Wool, Phosphate, Sulphate of Ammonia, Nitrate of Soda, Rubber, Dyes, Drugs and Chemicals, Jute and Gunnies, Flax and Hemp, Wheat, Seeds, and other Cereals, Bean Cakes, Lumber, etc., etc.

ENGINEERING DEPARTMENT

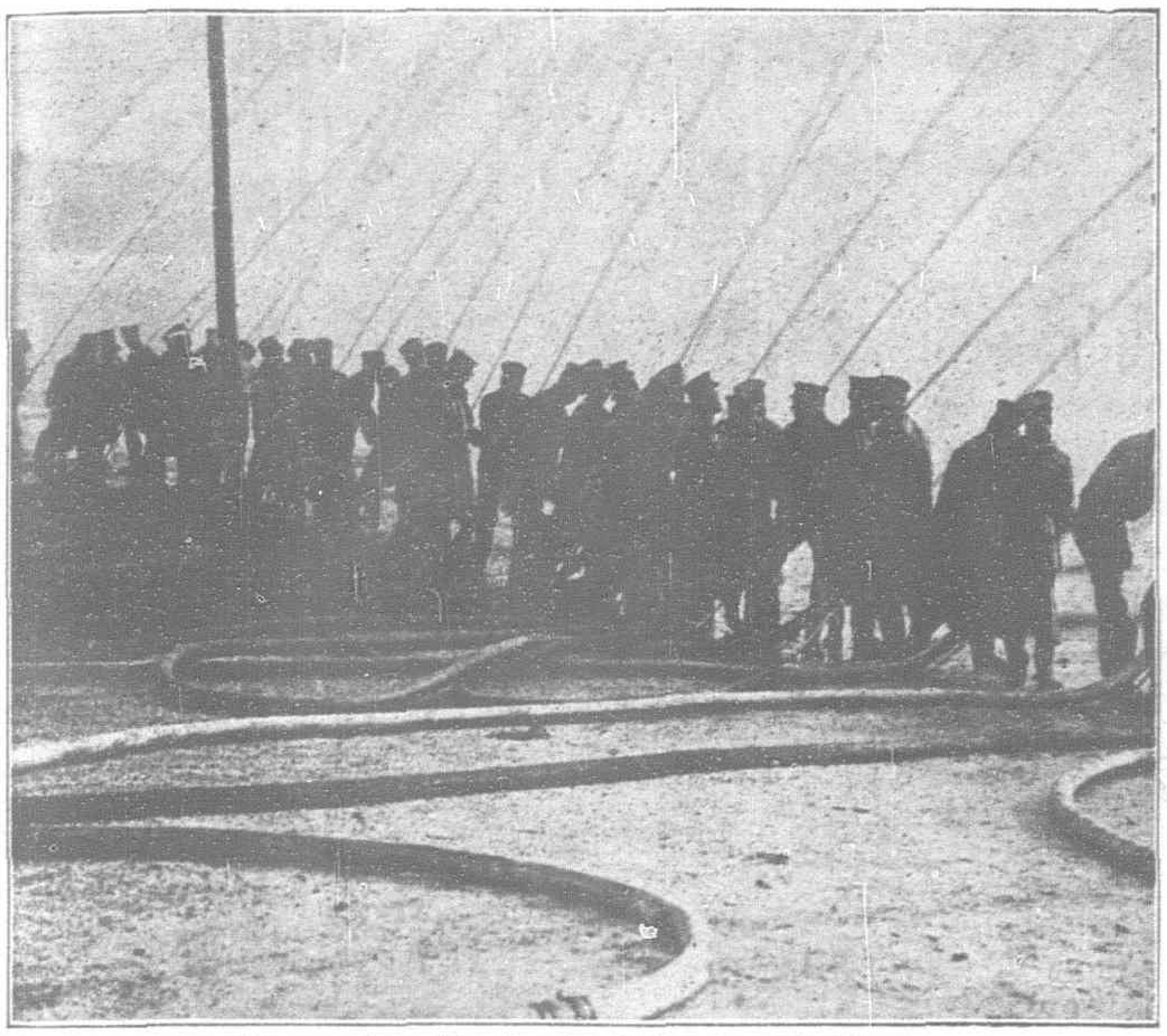
Sole Agents for Leading American and European Makers, including

American Locomotive Co.
Bucyrus Co.
California National Supply Co.
De La Vergne Machine Co.
General Electric Co.
General Motors Export Co.
Manning Maxwell & Moore, Inc.

Mesta Machine Co.
Nordberg Manufacturing Co.
Sullivan Machinery Co.
Belliss & Morcom, Ltd.
Geo. Cradock & Co., Ltd.
Platt Brothers & Co., Ltd.
Ruston & Hornsby, Ltd., etc., etc.

Also, AGENTS IN JAPAN, ORIENT, and INDIA for Well-known Japanese Insurance Cos.

Our Experience a Guarantee of Reliability



Streams from Six Pumps of American-LaFrance

After 78 years' experience in manufacturing (*not* merely assembling) Motor Fire Apparatus of all types, Fire Department Supplies and Safety Devices, we are today unusually well equipped to fill every requirement of modern Fire Departments.

An unlimited guarantee against defective workmanship and material is given with each piece of American-La France Motor Fire Apparatus.

Over 4,000 pieces of our Motor Fire Apparatus are now in use in various parts of the world—in 9 out of 10 American cities, and in 29 cities abroad.

We also manufacture Commercial Motor Trucks.

Export orders are given special attention and correctly prepared for shipment.

Illustrated catalog and full particulars may be obtained quickly by addressing our nearest sales representatives.

Okura & Company
Tokyo, Japan

Pacific Commercial Co.
Manila, P. I.

Mustard & Co.
Shanghai, China

North Auckland Farmers' Co-operative, Ltd.
Dargaville, N. Z.

Cable Address:
"Amlafranco"

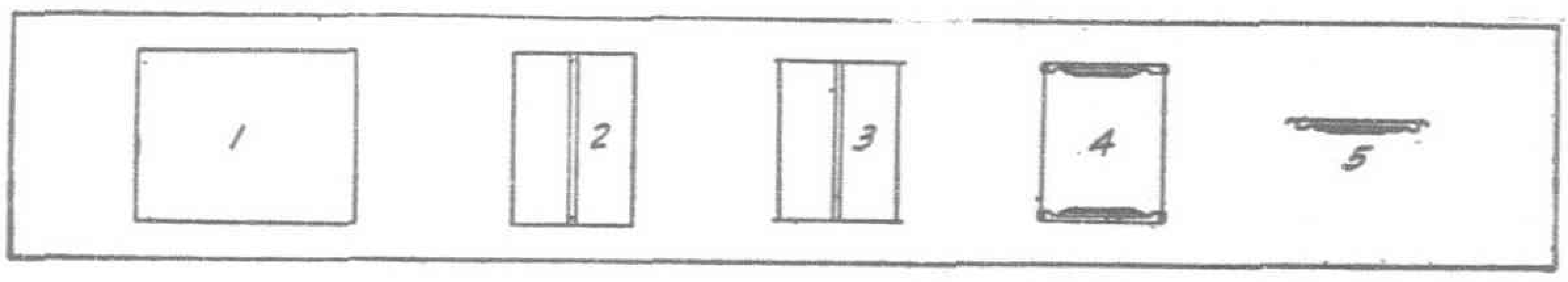
AMERICAN-LAFRANCE FIRE ENGINE COMPANY, INC.

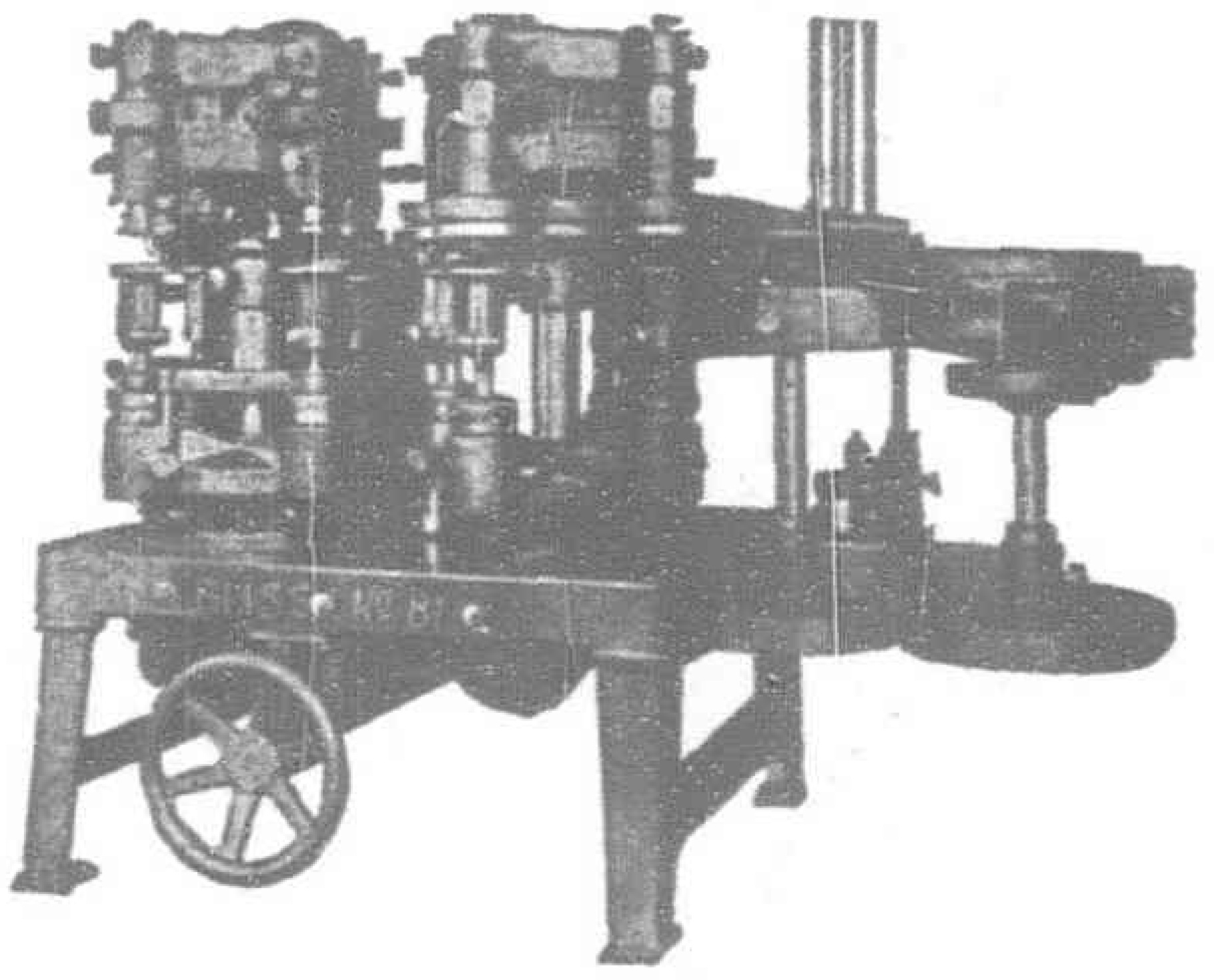
Cable Codes:
Bentley's
A. B. C.
Fifth Edition
Western Union

Export Department:
Fisk Building, Broadway at 57th Street, New York, U. S. A.

MACHINERY for Manufacturing Tin Cans—Tin Ware—Metal Packages Cutlery—Hardware—Aluminum Ware and Enamel Ware—Electrical Equipment. Also Horseshoe—Minting and Drop Forging Machinery

1857 BLISS 1924





"BLISS" No. 81 Double Seamer—The simplest and fastest machine built for attaching ends to bodies, built in two styles, one for the can shop and one for handling filled cans in the cannery. This is one of the machines which go to make up our High Speed Automatic Sanitary Can Making Line.

In previous advertisements we illustrated Tin Can Machinery for small production. In this one we show one of the machines which go to make a standard unit for quantity production of round sanitary tin cans for fruits and vegetables. Each unit has a daily capacity of over 90,000 tin cans.

The illustration above shows the different operations in making a Sanitary Tin Can with "BLISS" High Speed Automatic Tin Can Machinery. They are as follows: Slitting, Body Notching, Hock Forming, Body Forming, Side Seam Closing and Soldering, Body Flanging, Double Seaming, Making Ends, Applying Compound, Testing.

"BLISS" High Speed Automatic Sanitary Tin Can Machinery is "standard the world over" and in successful operation in every country. To quote we must have samples or drawings of the cans and know daily production desired.

"BLISS" on your machinery is more than a name; it is a guarantee.

E. W. BLISS CO. MAIN OFFICE AND WORKS **BROOKLYN, N. Y., U. S. A.**

American Factories: BROOKLYN, N.Y, HASTINGS, MICH. CLEVELAND, OHIO. SALEM, OHIO.

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ENGLAND, Pocock St., Blackfriars Rd., S. E., London
ITALY, 345 Via Nizza, Turin
FRANCE, 54 Blvd. Victor-Hugo St. Ouen, Paris

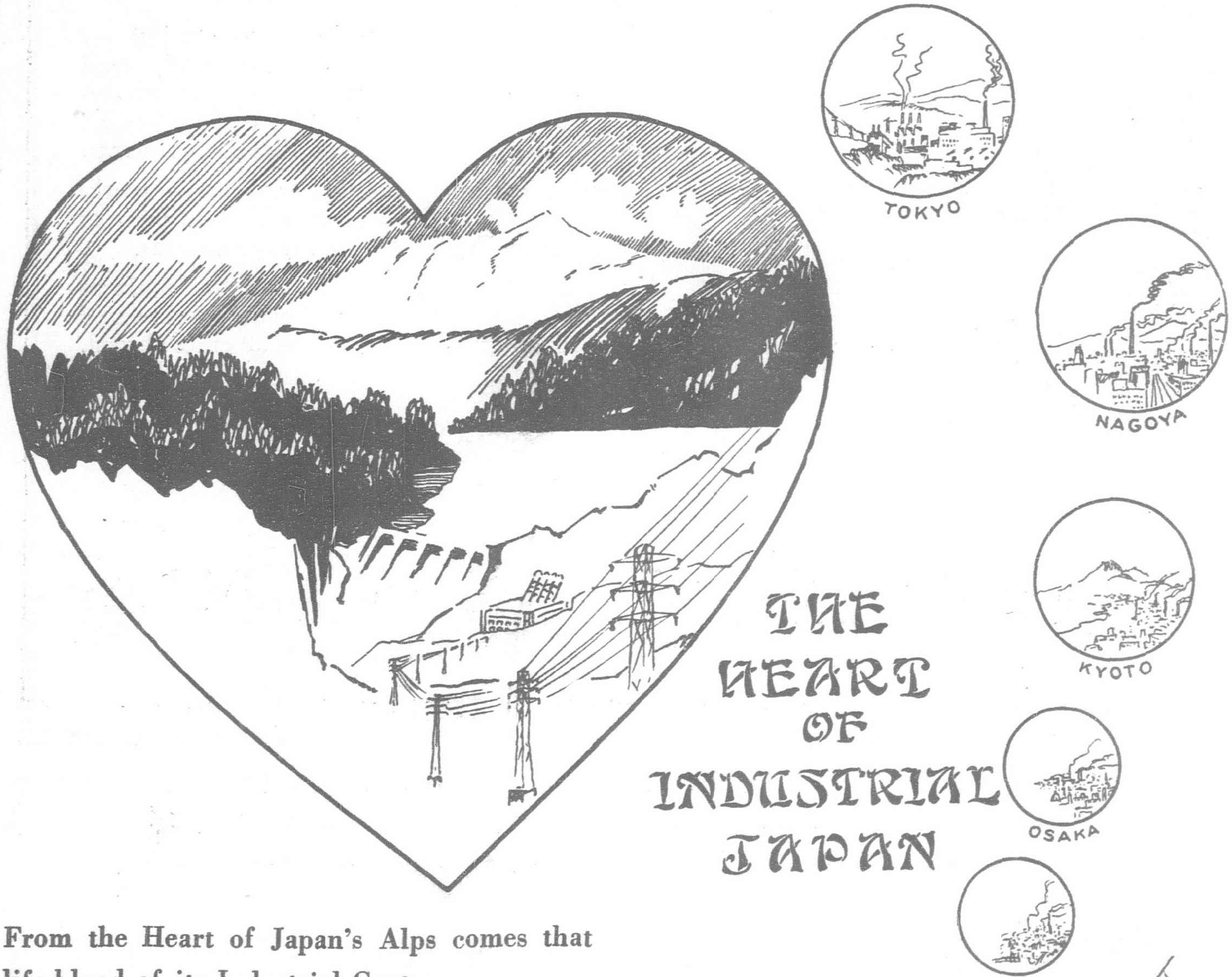
FOREIGN REPRESENTATIVES:

INDIA
Alkin and Duff Eng. Co.,
Clive Building, Calcutta

JAPAN
Horne Company, Ltd.,
Tokyo, Osaka

CHINA
Allied Machinery Co. of America,
Shanghai, Tientsin, Dairen, Manchuria

No. 245


TOKYO
NAGOYA
KYOTO
OSAKA
THE HEART OF INDUSTRIAL JAPAN

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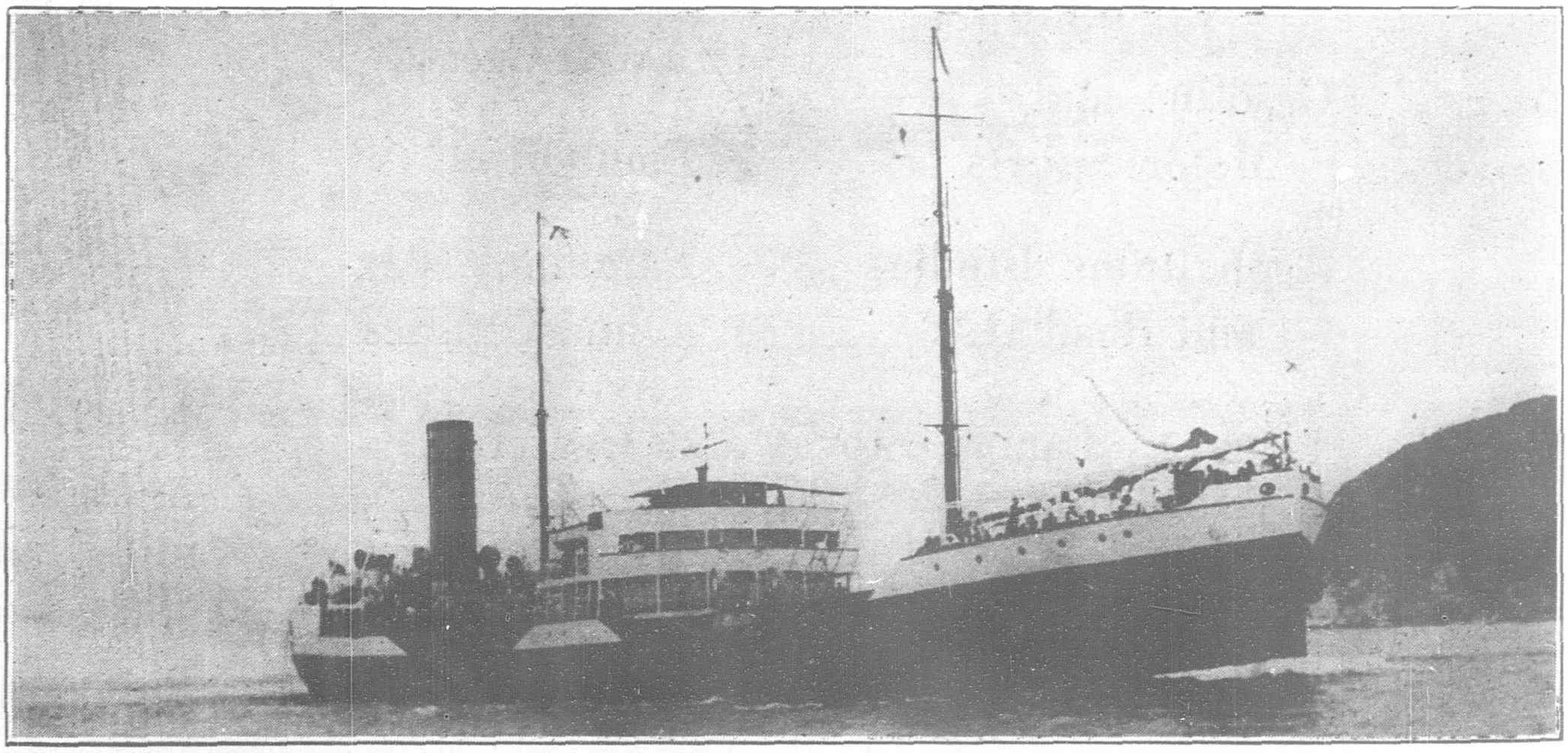

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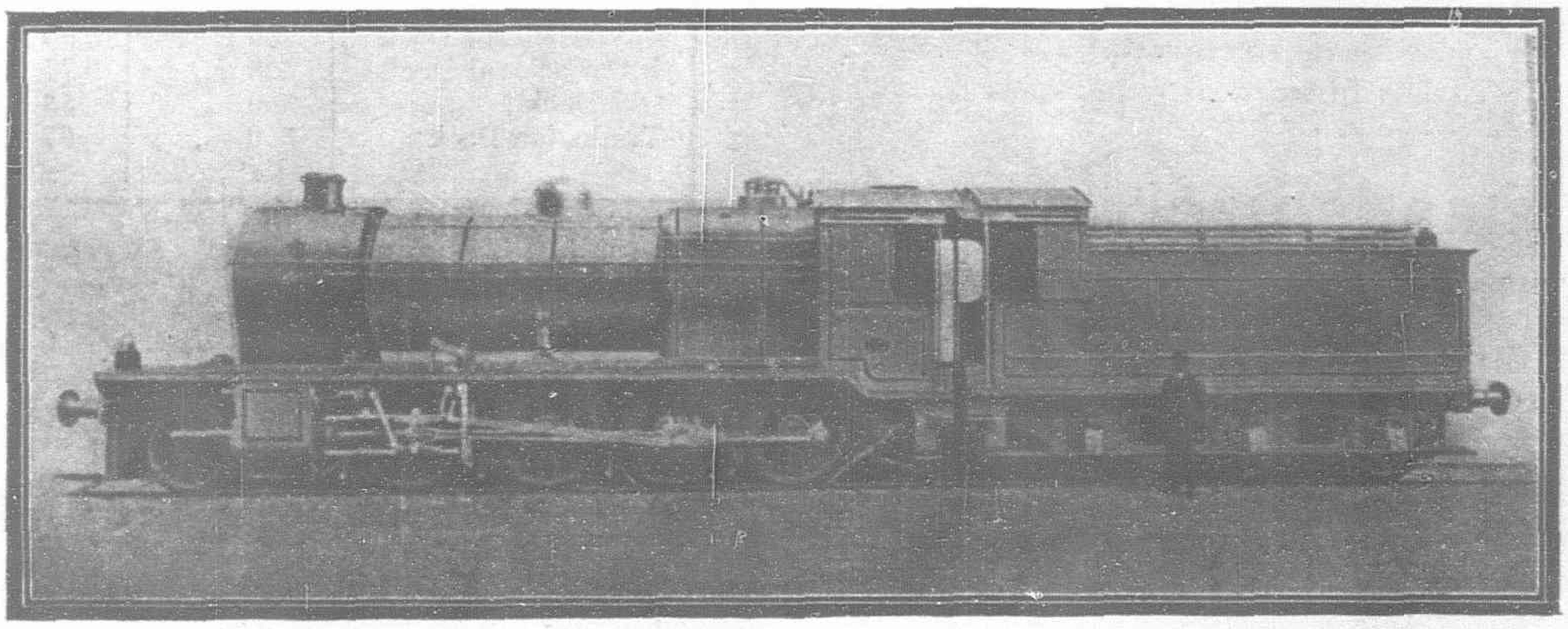

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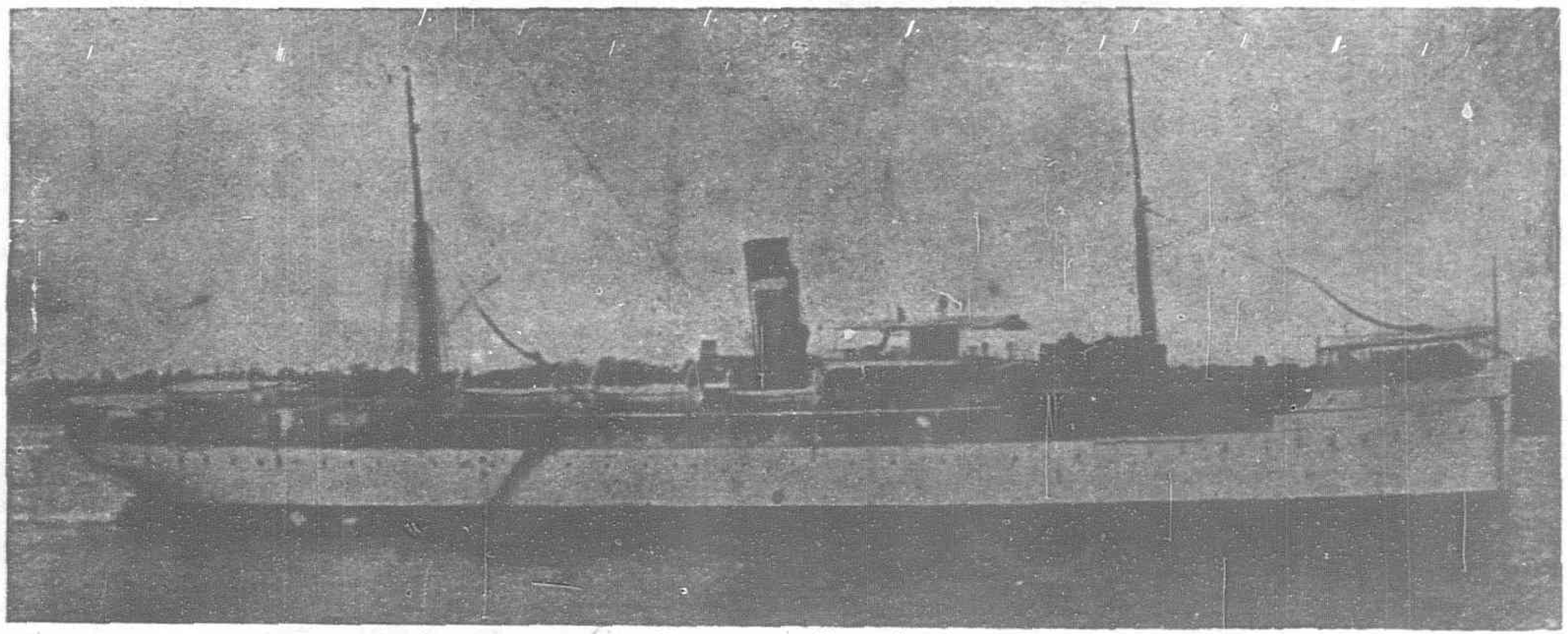

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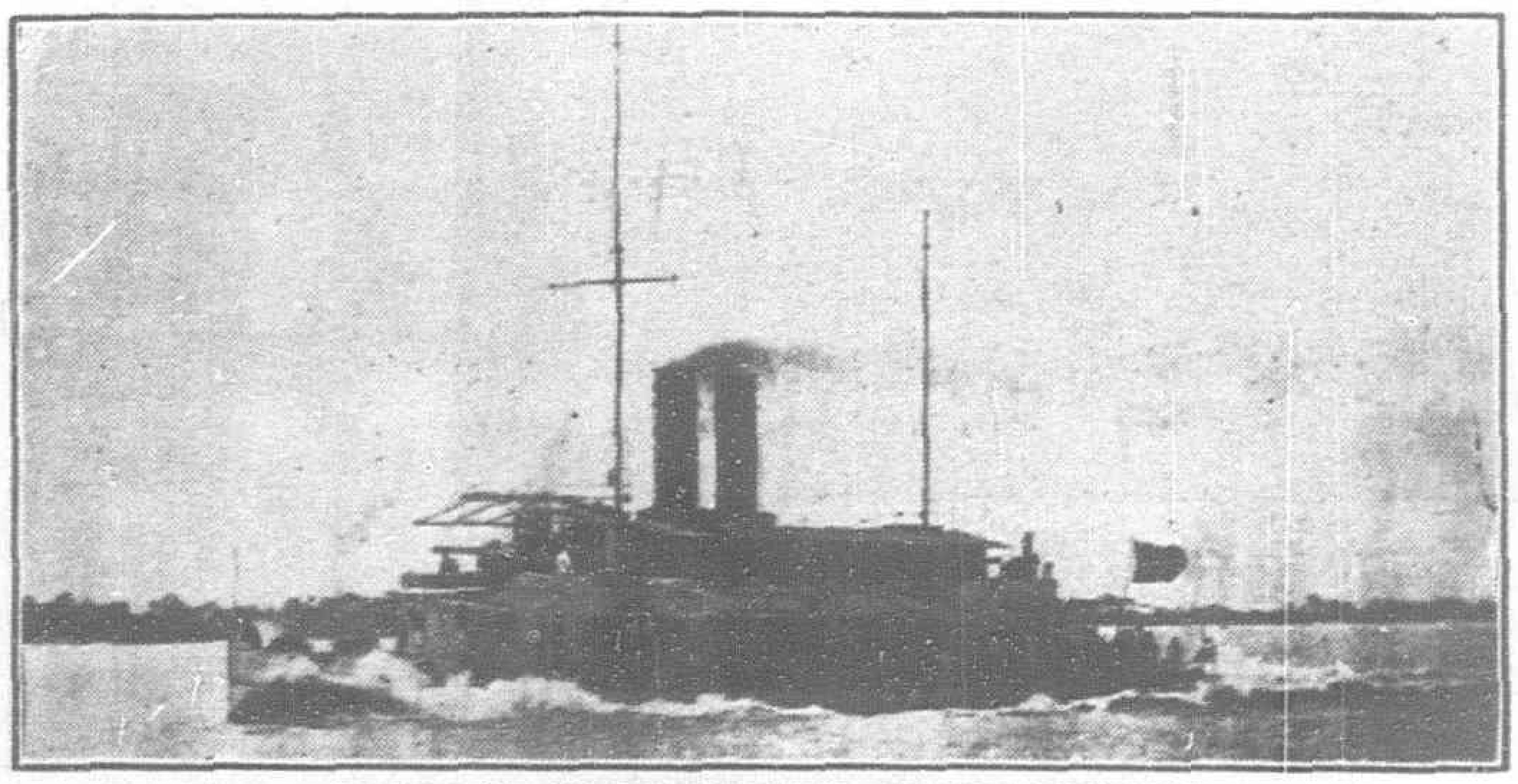

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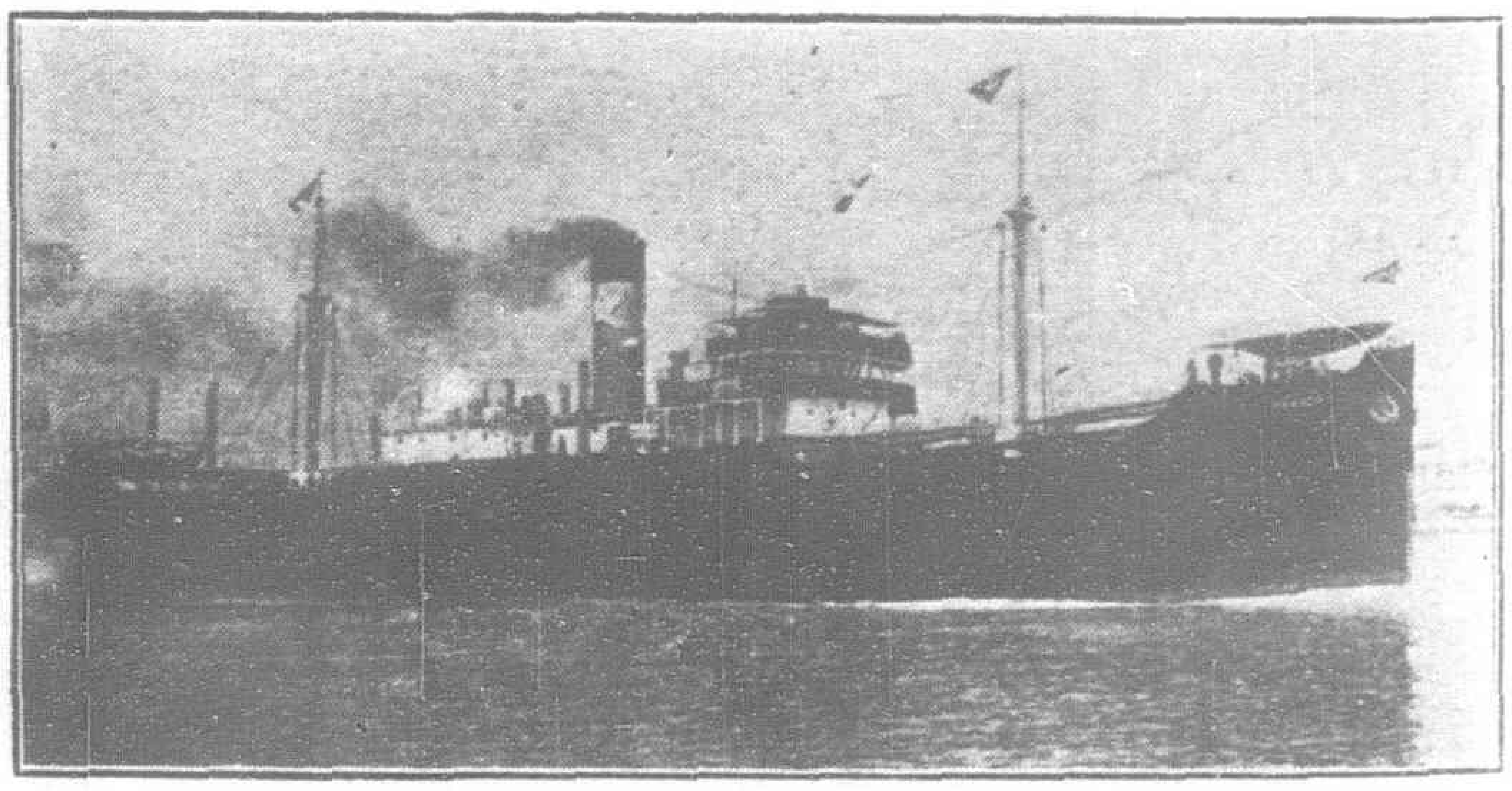

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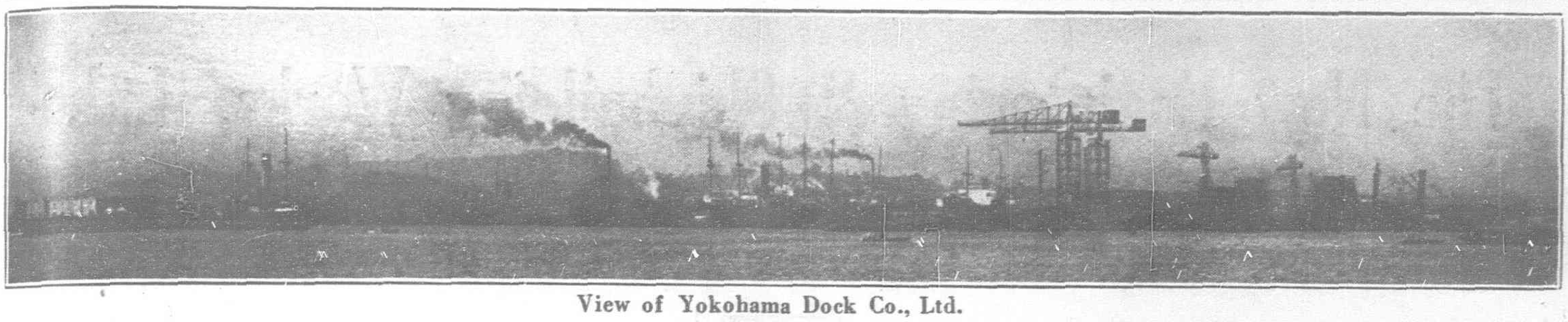

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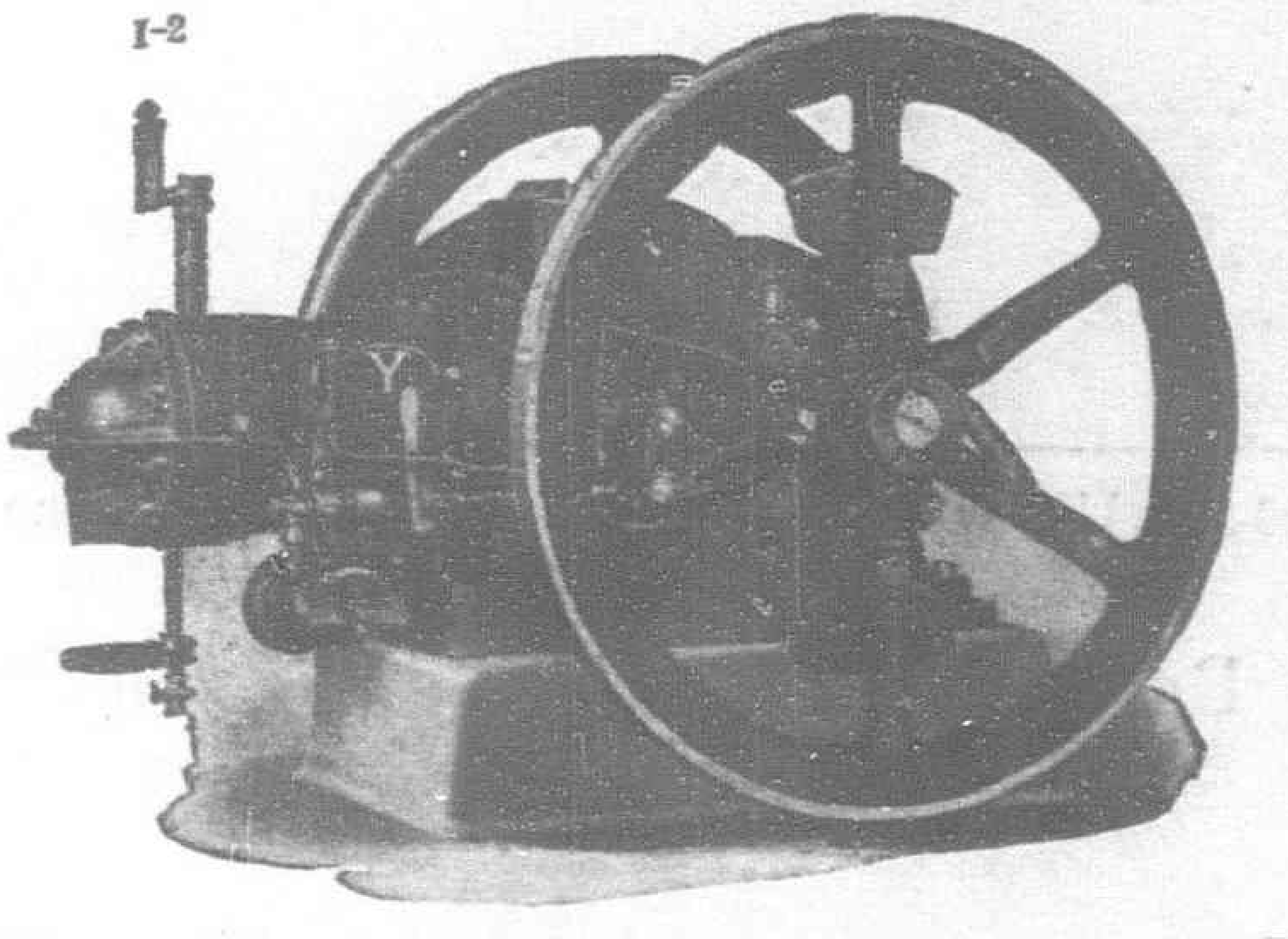

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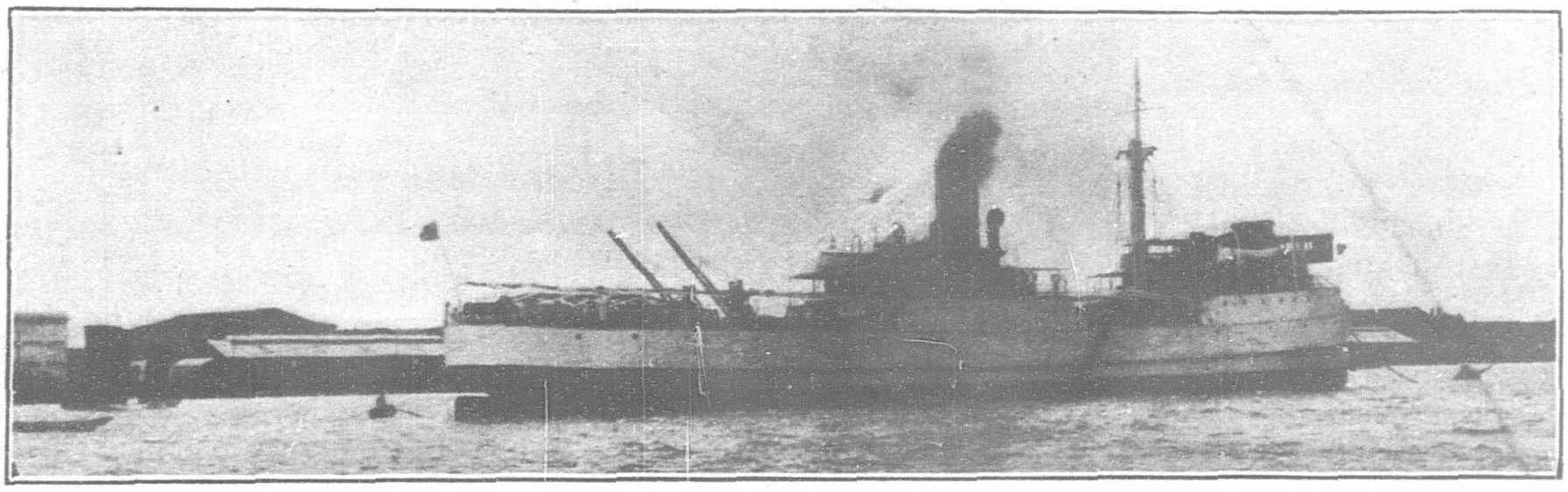

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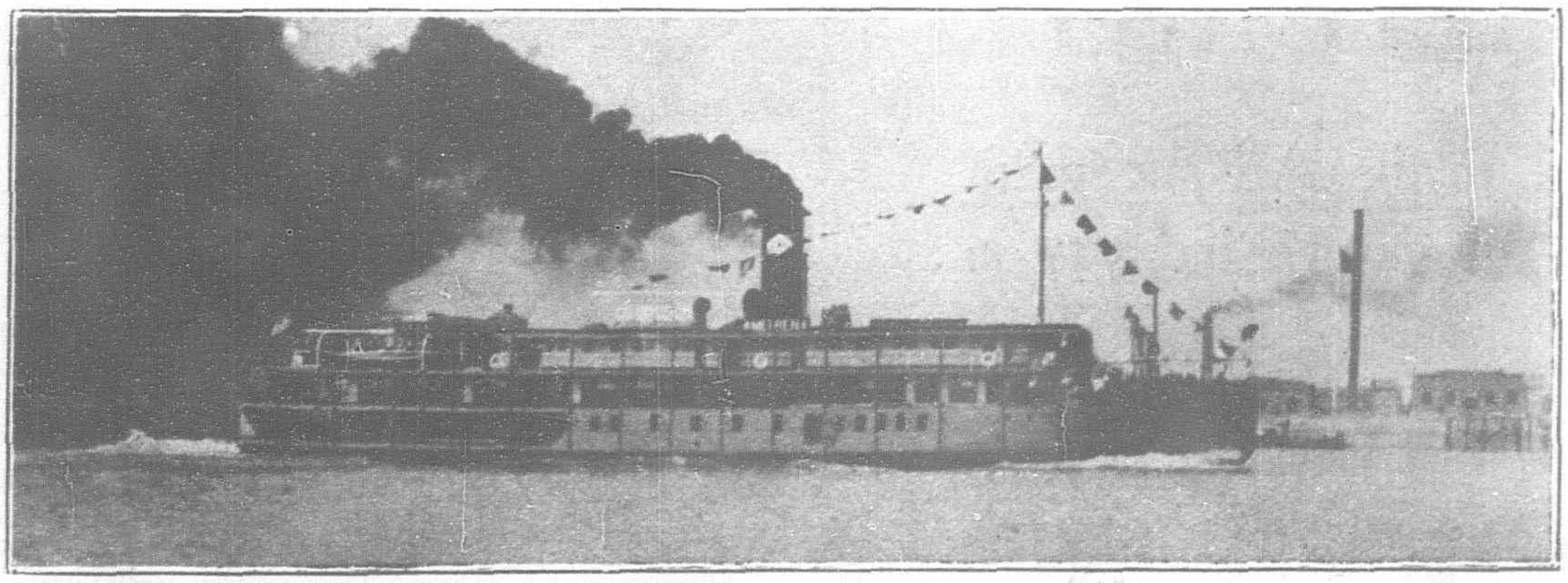

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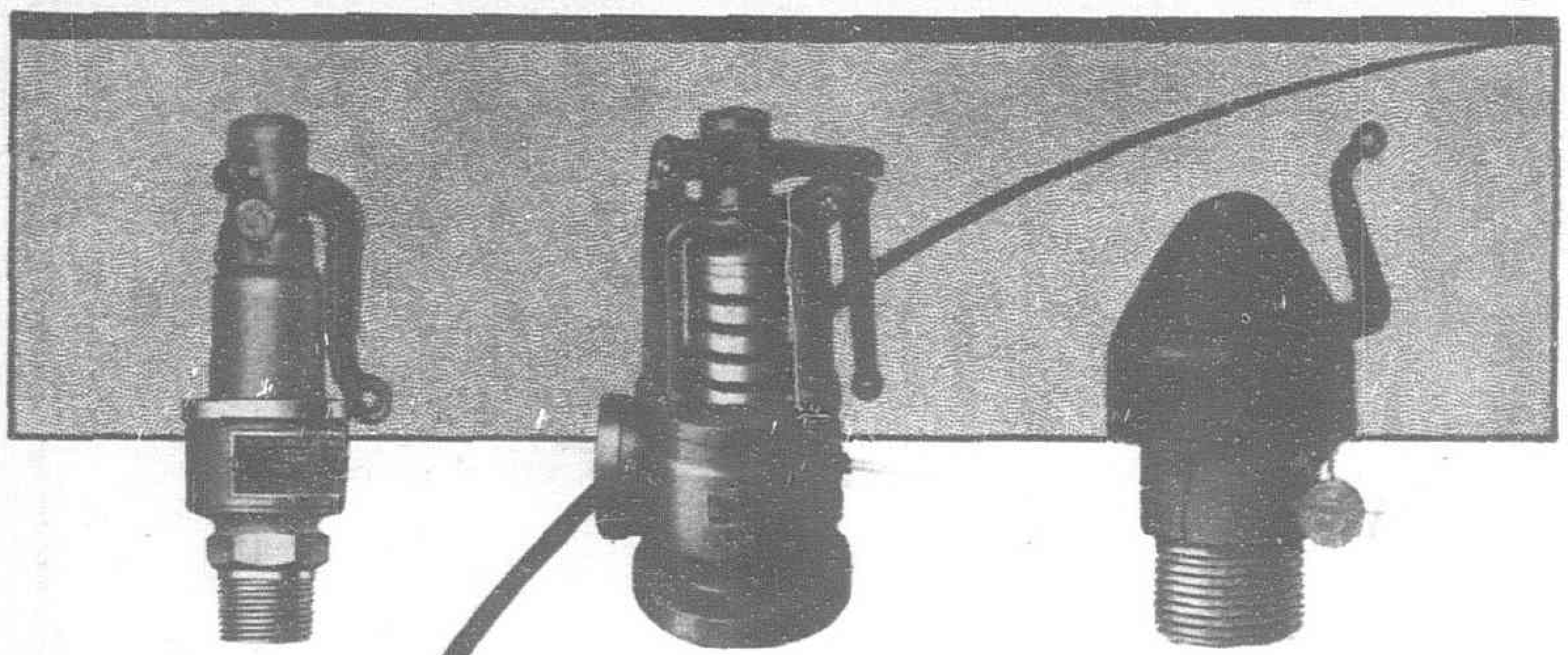

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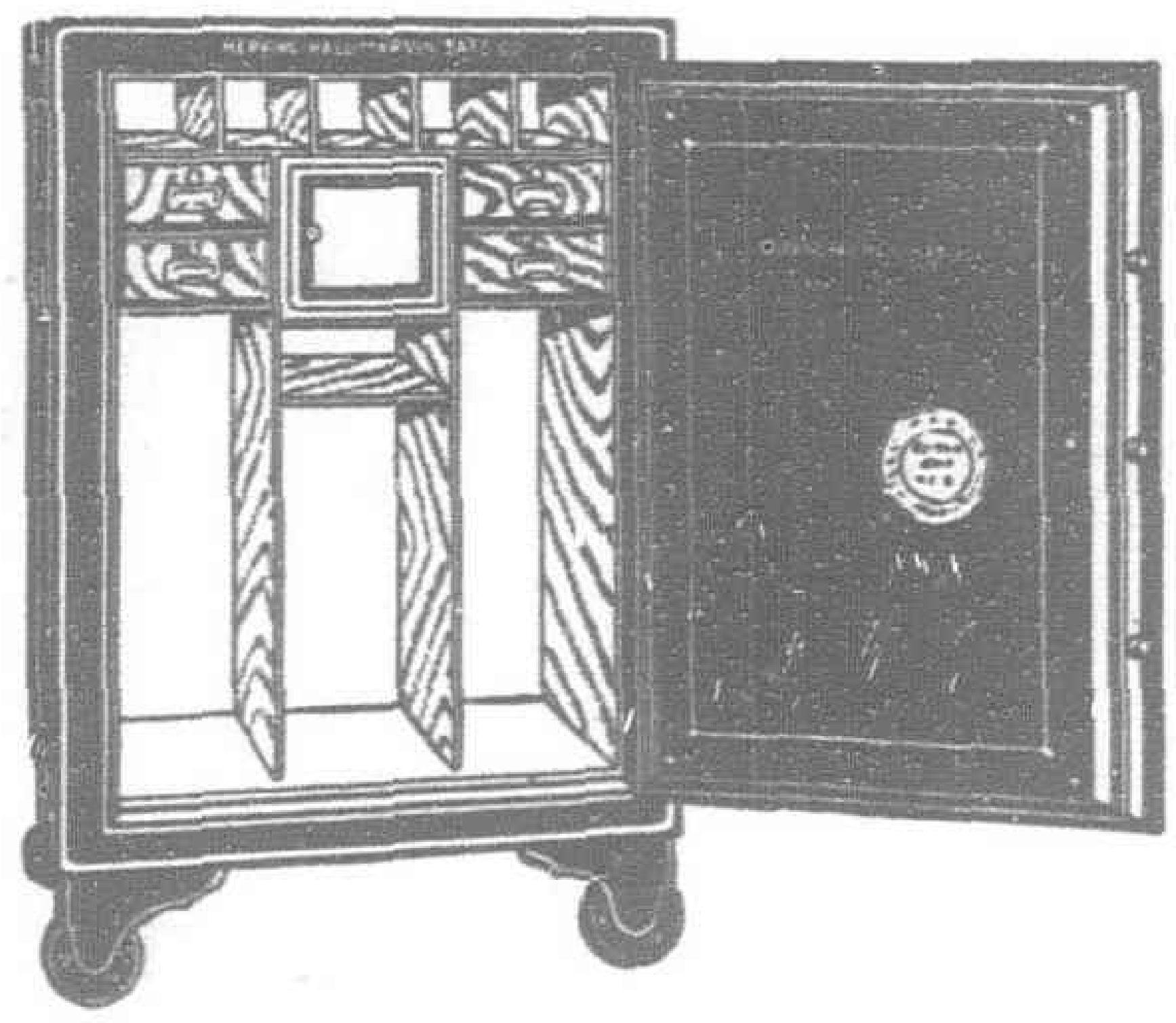

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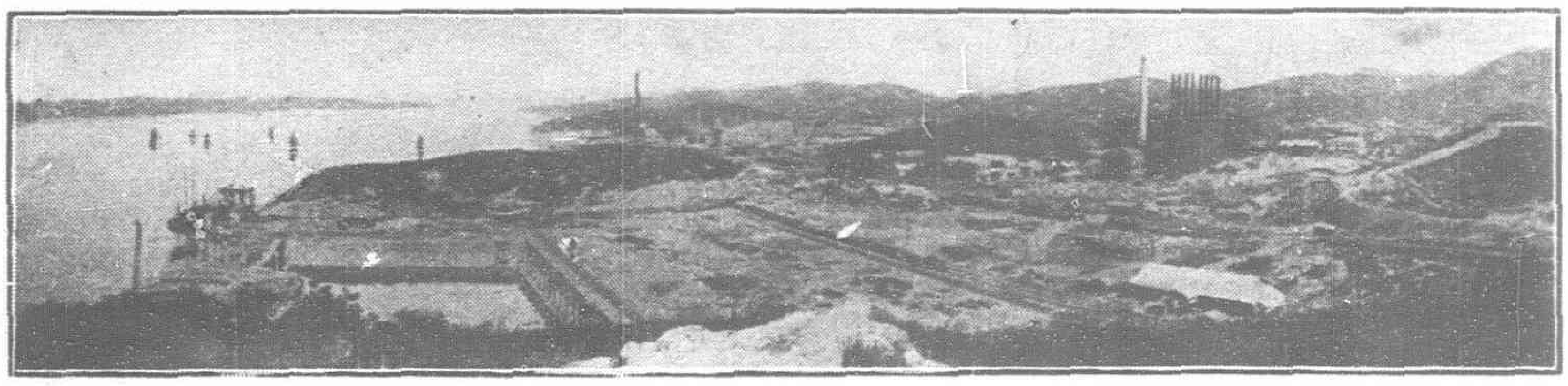

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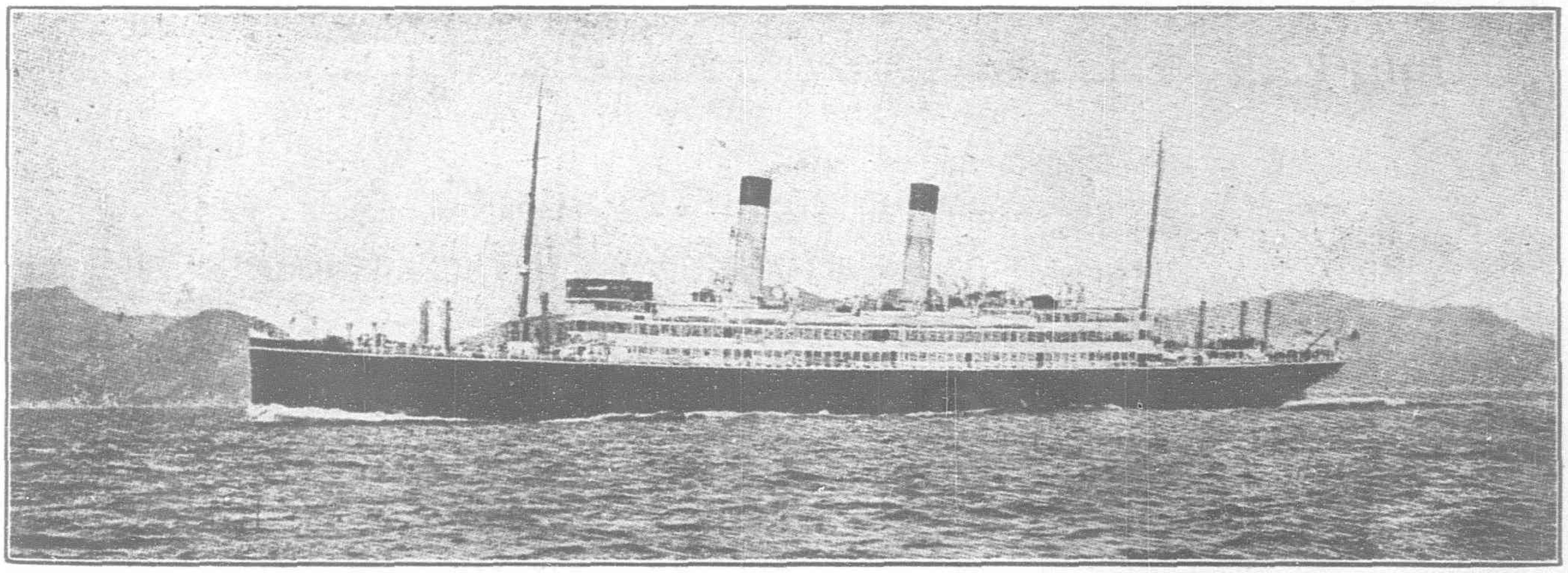

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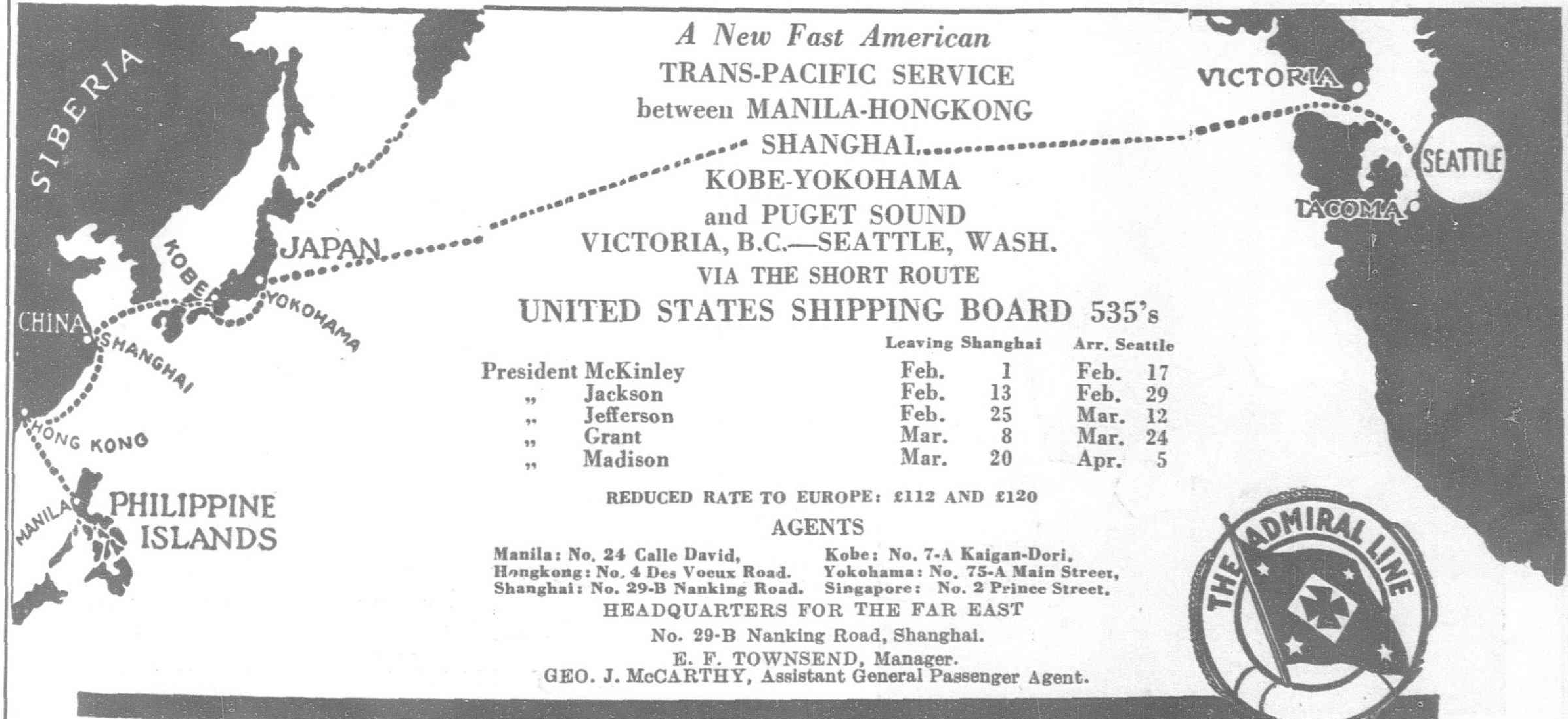

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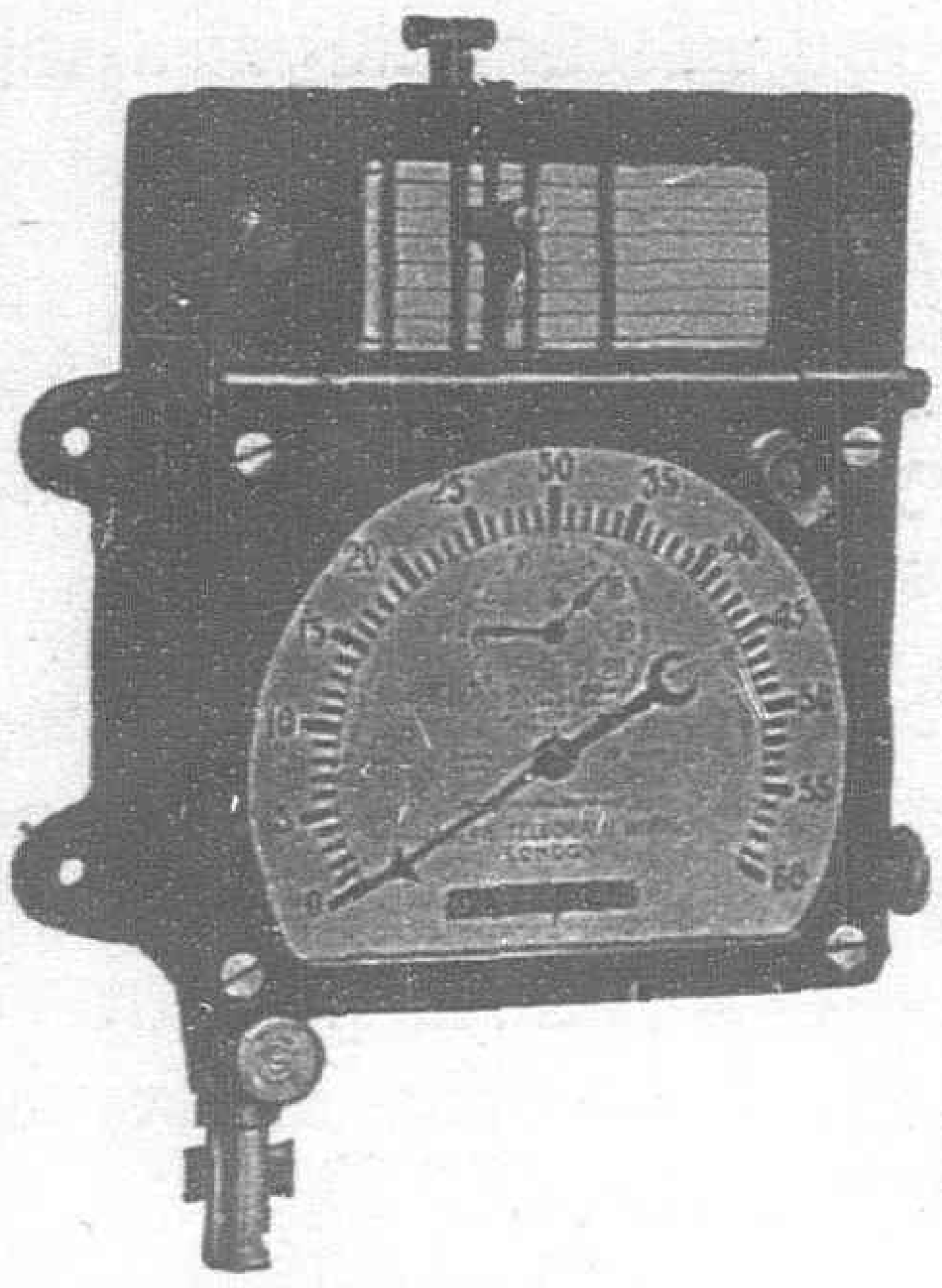


THE BEST LOCOMOTIVE SPEED INDICATORS & RECORDERS

WITH CONJUGATE MOVEMENT

TELOC TYPE

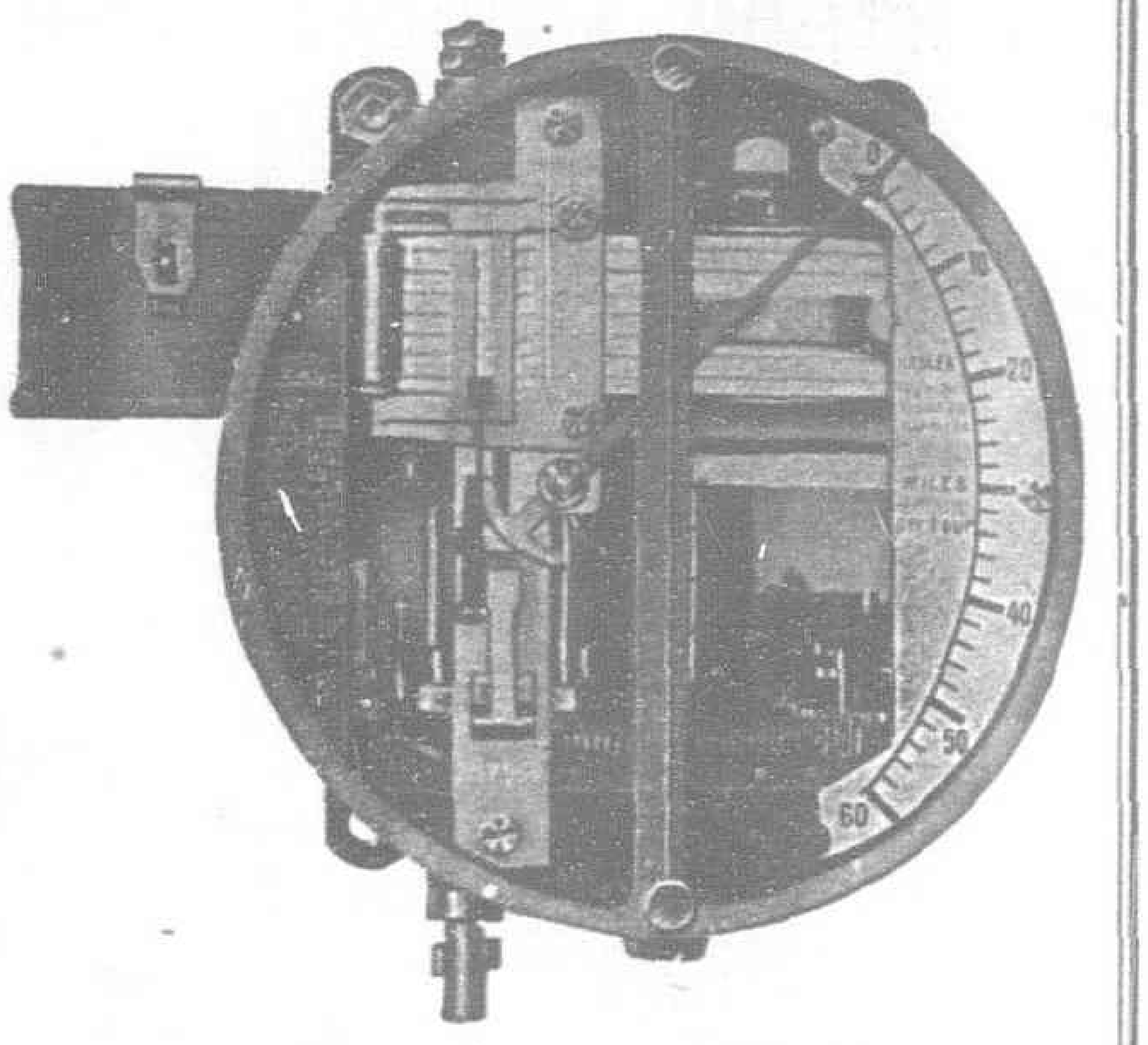
Chart Feed on a Mileage Basis of 10 m/m per Mile.

INDICATES:—Speed.
Total mileage since application of Instrument.
Total mileage of each run.
Time of Day in Hours and Minutes.
RECORDS:—Speed attained at any point of run.
Time the engine or coach is at work.
Distance covered.
Duration (up to 24 hours) and point of stops.
Time of Day in Hours and Minutes.
If desired apparatus to record working of Westinghouse or Vacuum Brakes.

HASLER TYPE

Chart Feed on a Time Basis of 4 m/m per Minute.

INDICATES:—Speed.
RECORDS:—Speed attained at any point of the run.
Time the engine or coach is at work.
Distance covered.
Duration and point of stops.
If desired bell can be fitted to ring at predetermined speed, or apparatus to record working of Westinghouse or Vacuum Brakes.



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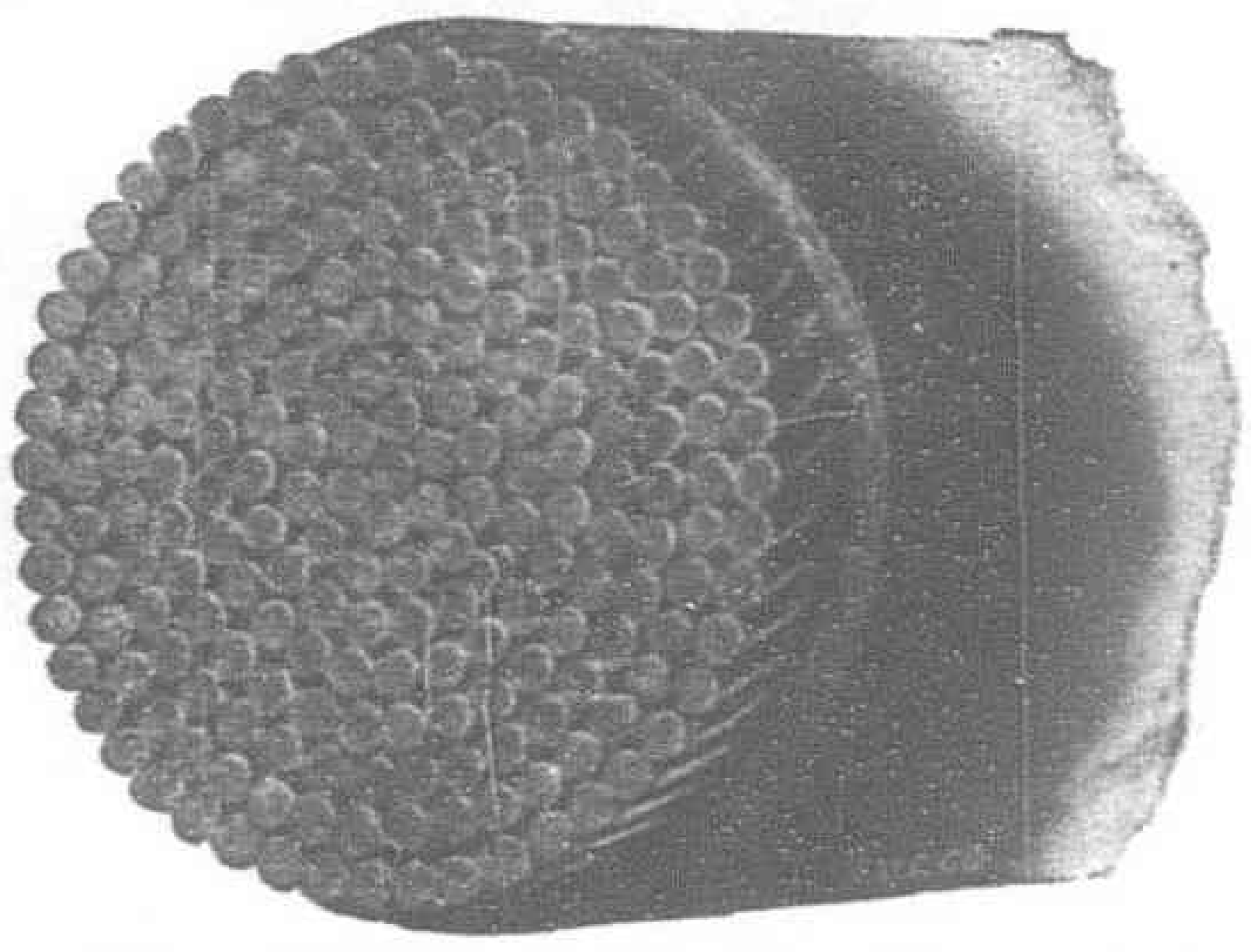

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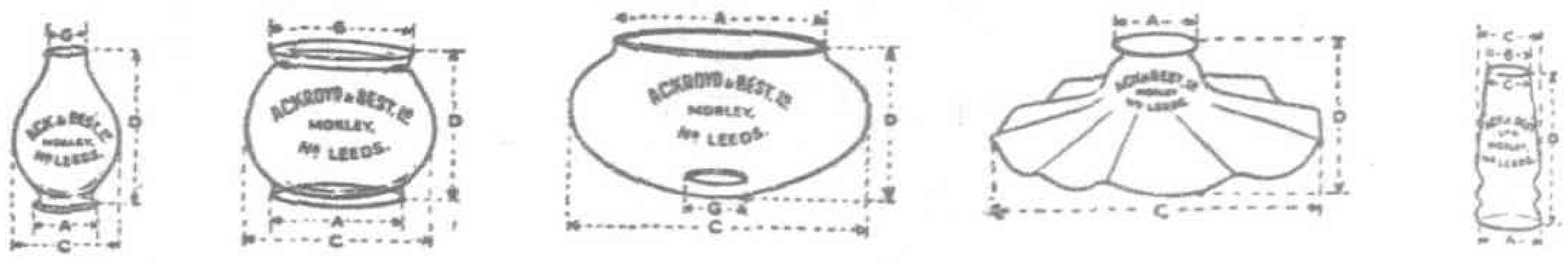

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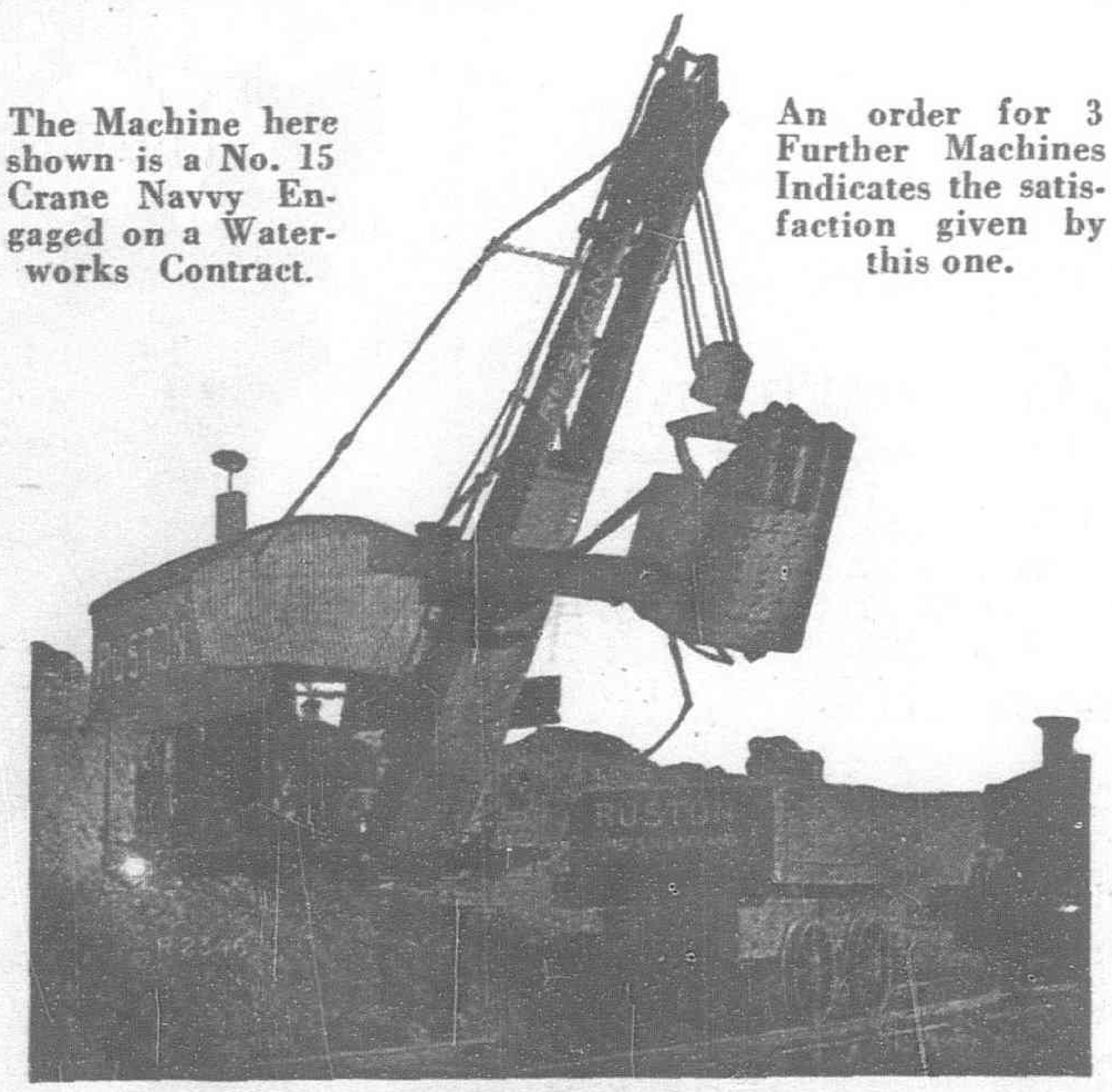

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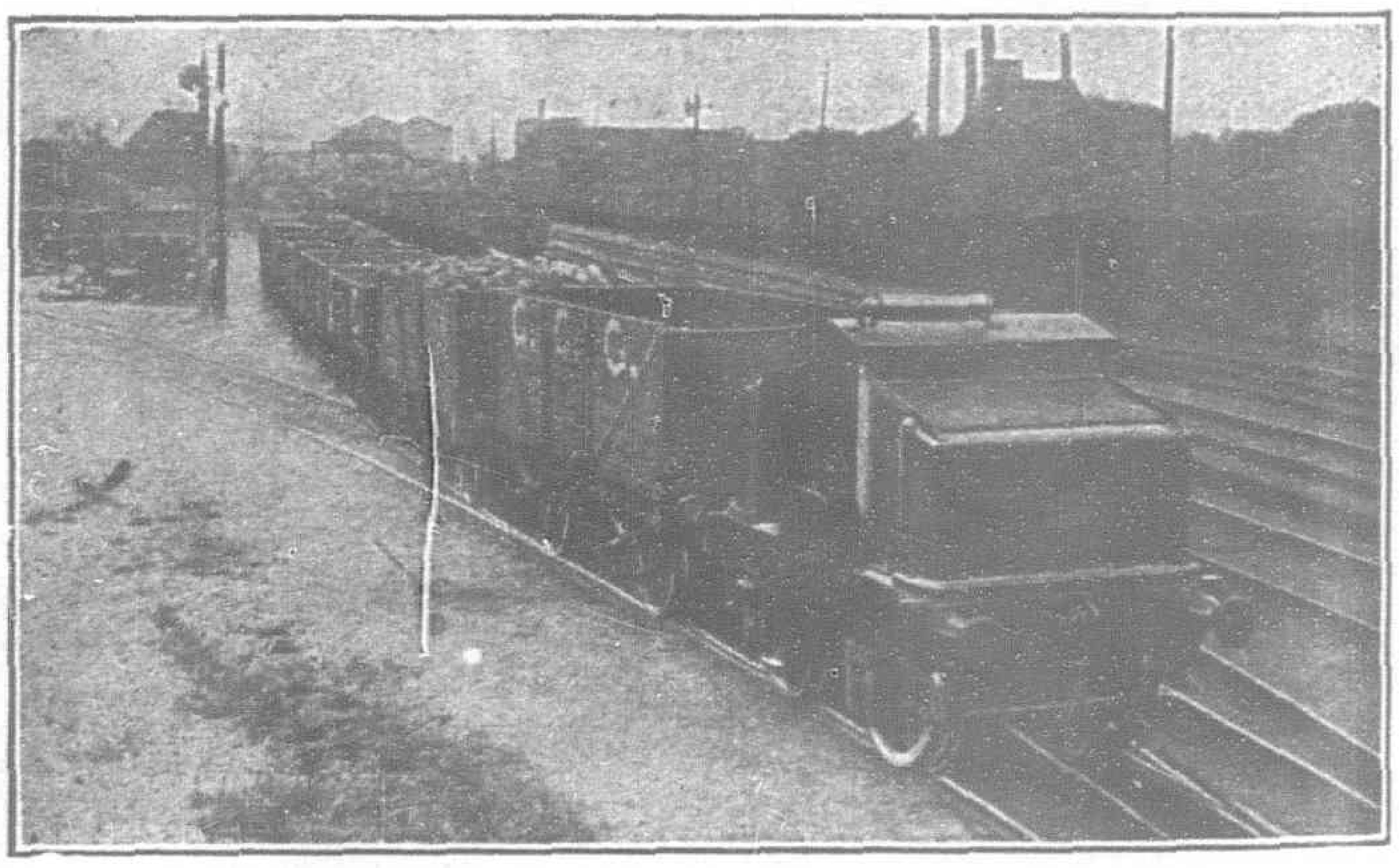

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These vehicles are thoroughly reliable, economical, inexpensive to maintain, easily handled and entail no stand-by losses

All kinds of Light Railway Material supplied

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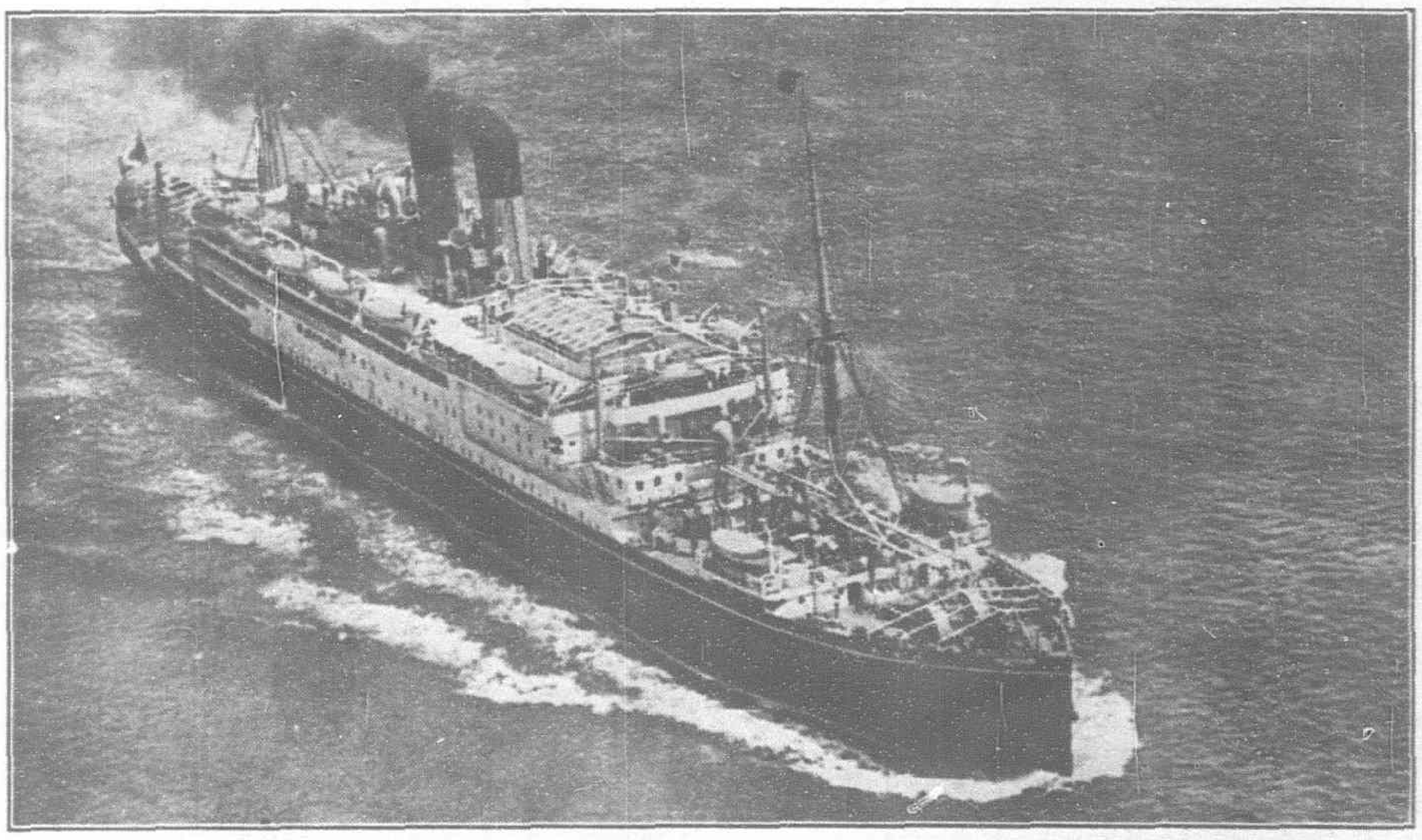
TAIYO MARU	22,000 Tons
TENYO MARU	22,000 Tons
SHINYO MARU	22,000 Tons
KOREA MARU	20,000 Tons
SIBERIA MARU	20,000 Tons



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RAKUYO MARU	18,500 Tons
GINYO MARU	16,000 Tons

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PERFECT SERVICE—UNEQUALLED CUISINE

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Royal Exchange Assurance Corporation.

Sea Insurance Co., Ltd.

Guardian Assurance Co., Ltd.

KOKUSAI KISEN KAISHA

Nominal Capital	Yen	100,000,000.00
Paid-up Capital	„	87,500,000.00
Aggregate Tonnage		500,000 Tons

FLEET OF STEAMSHIPS

Name	Tons D.W.
Rozan-Maru	8,700
Vancouver-Maru	9,100
Boston-Maru	8,800
Tofuku-Maru	9,100
Chifuku-Maru	9,100
Ryufuku-Maru	9,100
Hankow-Maru	6,400
Yoni-Maru	11,000
Taibu-Maru	8,900
San Francisco-Maru	9,100
Naple-Maru	9,100
Glasgow-Maru	9,100
Yayoi-Maru	8,700
Yaye-Maru	11,000
Malta-Maru	8,700
Buyo-Maru	8,800
Brazil-Maru	9,100
Kofuku-Maru	9,100
Yezari-Maru	6,900
Yugao-Maru	5,000
Yubaye-Maru	5,000
Sydney-Maru	6,400
Shanghai-Maru	6,400
Singapore-Maru	9,100
Jyufuku-Maru	9,100
Hiyeizan-Maru	6,700
Capetown-Maru	9,100
Suez-Maru	6,600
Daio-Maru	9,000
Kashu-Maru	8,800
No. 2 Kifunesan-Maru	5,000
Yousan-Maru	5,000
Taisan-Maru	5,000
Yuri-Maru	11,000
Texas-Maru	11,000
Tamatsu-Maru	6,600
Eifuku-Maru	9,100
Kifuku-Maru	9,100
Toyofuku-Maru	9,000
Raifuku-Maru	9,100
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Washington-Maru	9,100
Tokufuku-Maru	9,100
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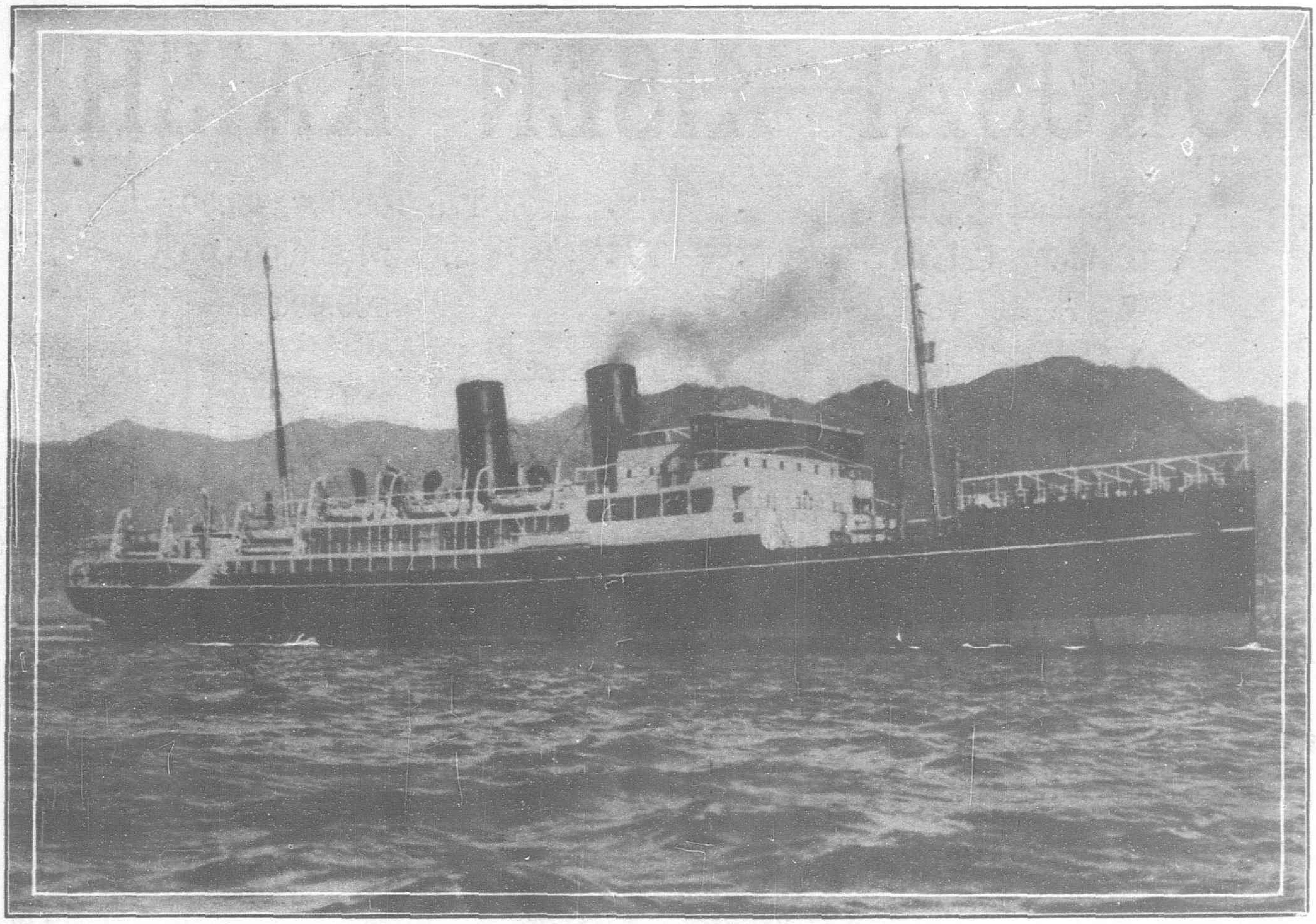
(NIPPON YUSEN KAISHA)
HEAD OFFICE: TOKYO, JAPAN



The s.s. "Nagasaki Maru"

JAPAN-CHINA RAPID EXPRESS LINERS

s.s. "Nagasaki Maru," s.s. "Shanghai Maru," 5,500 tons each, 26 hours' voyage
Between Shanghai and Nagasaki, Single passage rates: $35—$80

PROPOSED SAILINGS (Twice a week)

China-Bound	Japan-Bound
Leave Nagasaki 9 a.m. Wed. & Sun.*	Leave Shanghai 6 a.m. Fri. & Tues.*
Arrive Shanghai Noon Thurs. & Mon.*	Arrive Nagasaki 10 a.m. Sat. & Wed.*

*Sailing dates for the "Shanghai Maru" Effective from March

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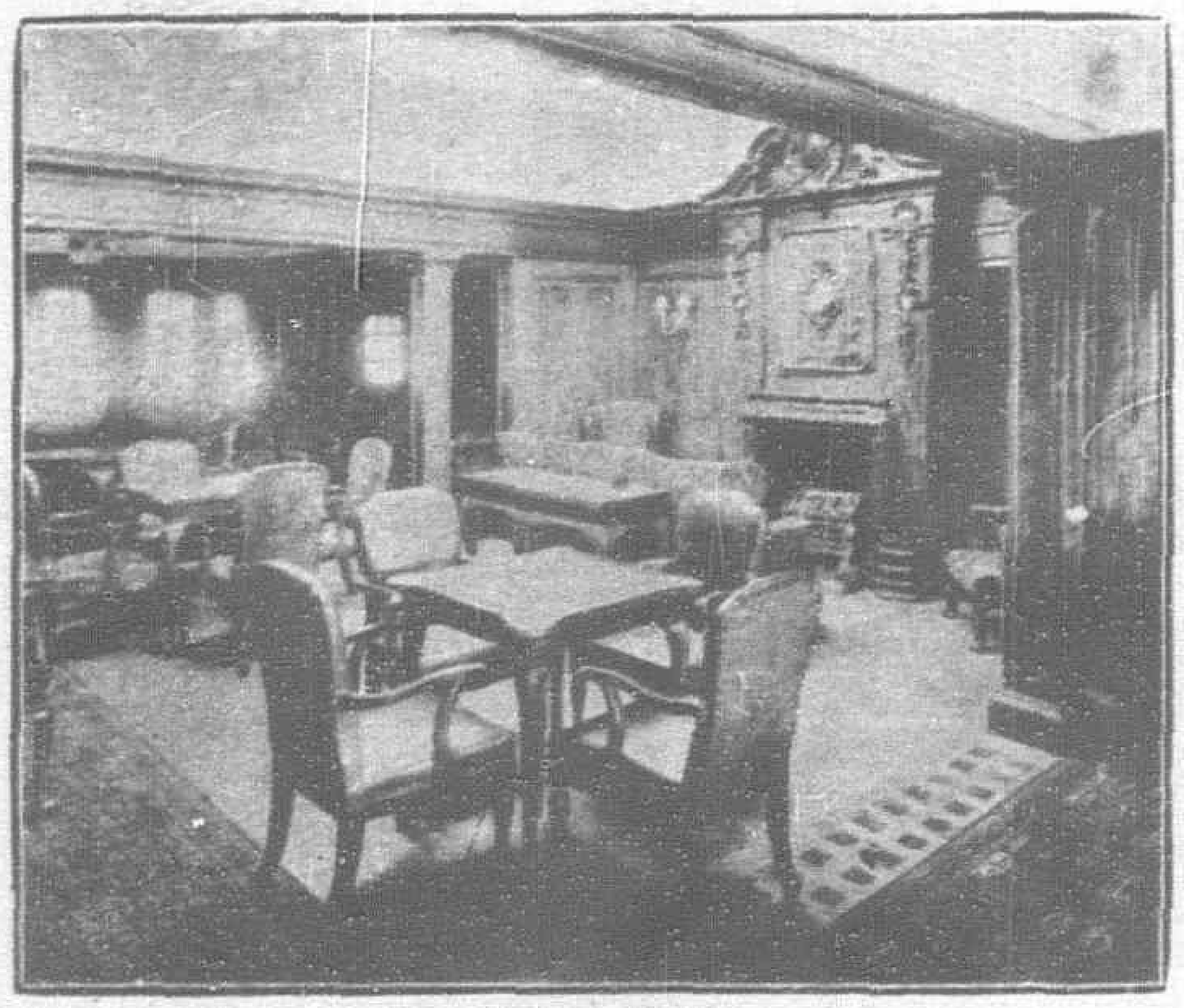
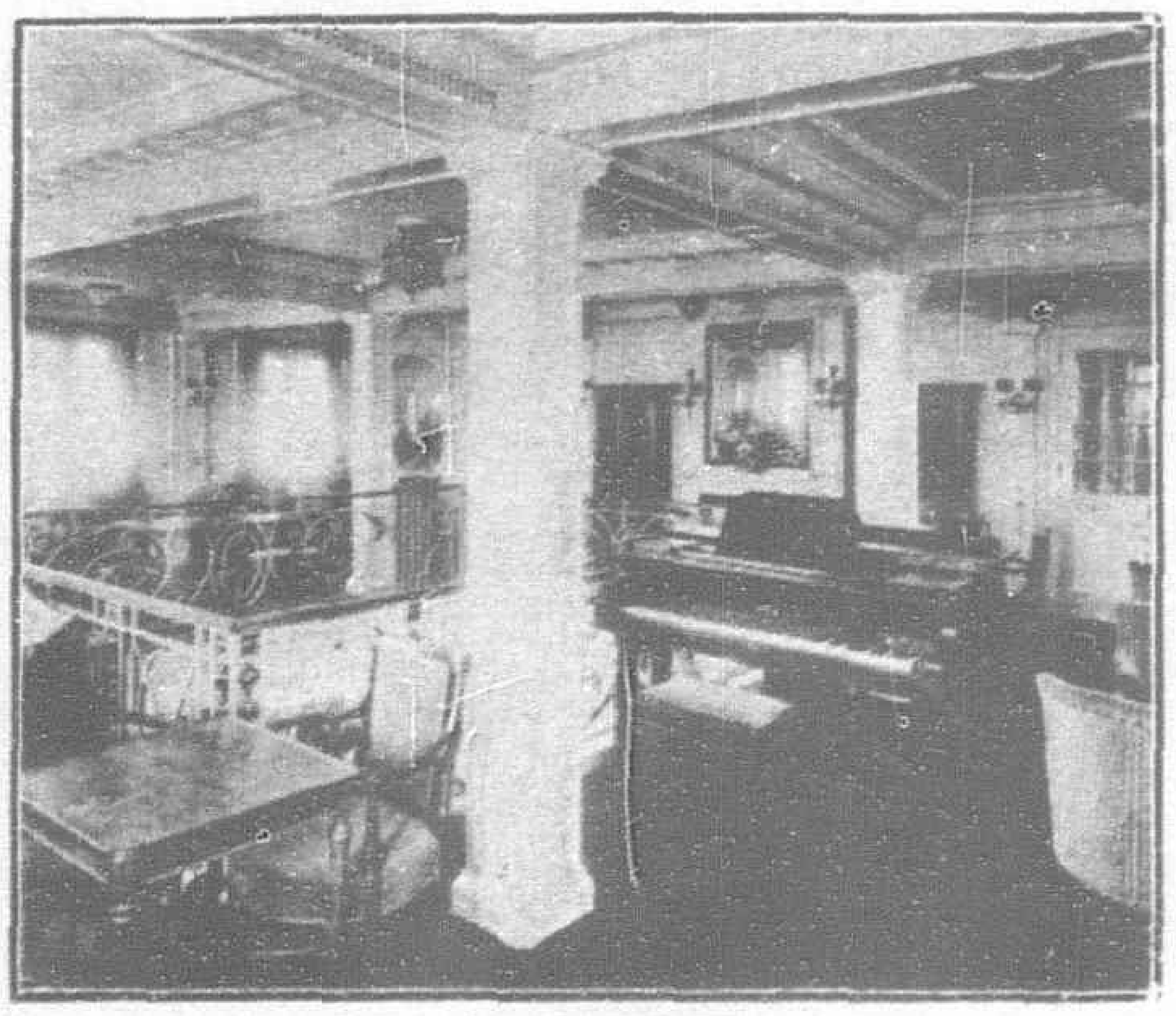
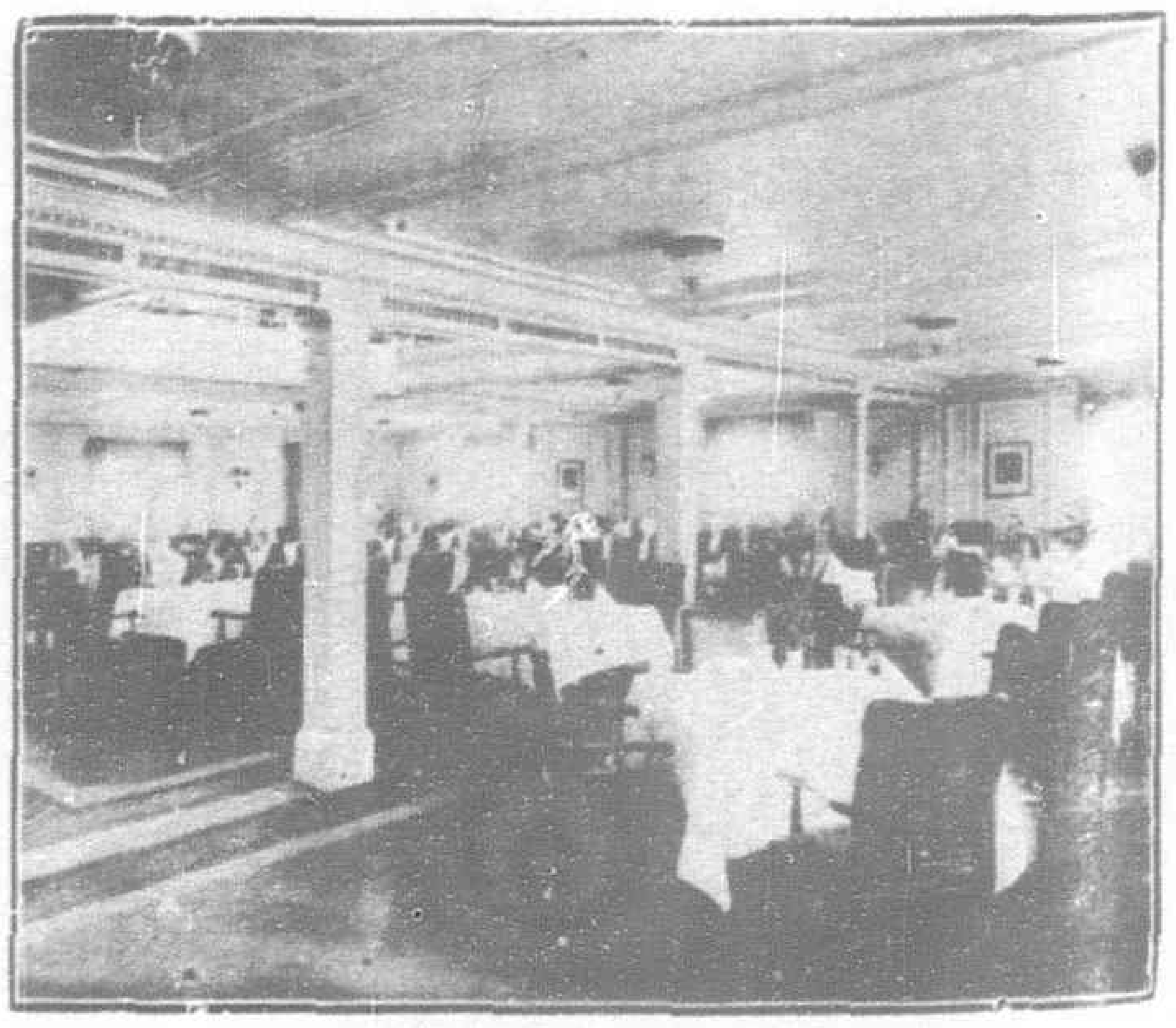


Smoking Room



Social Hall



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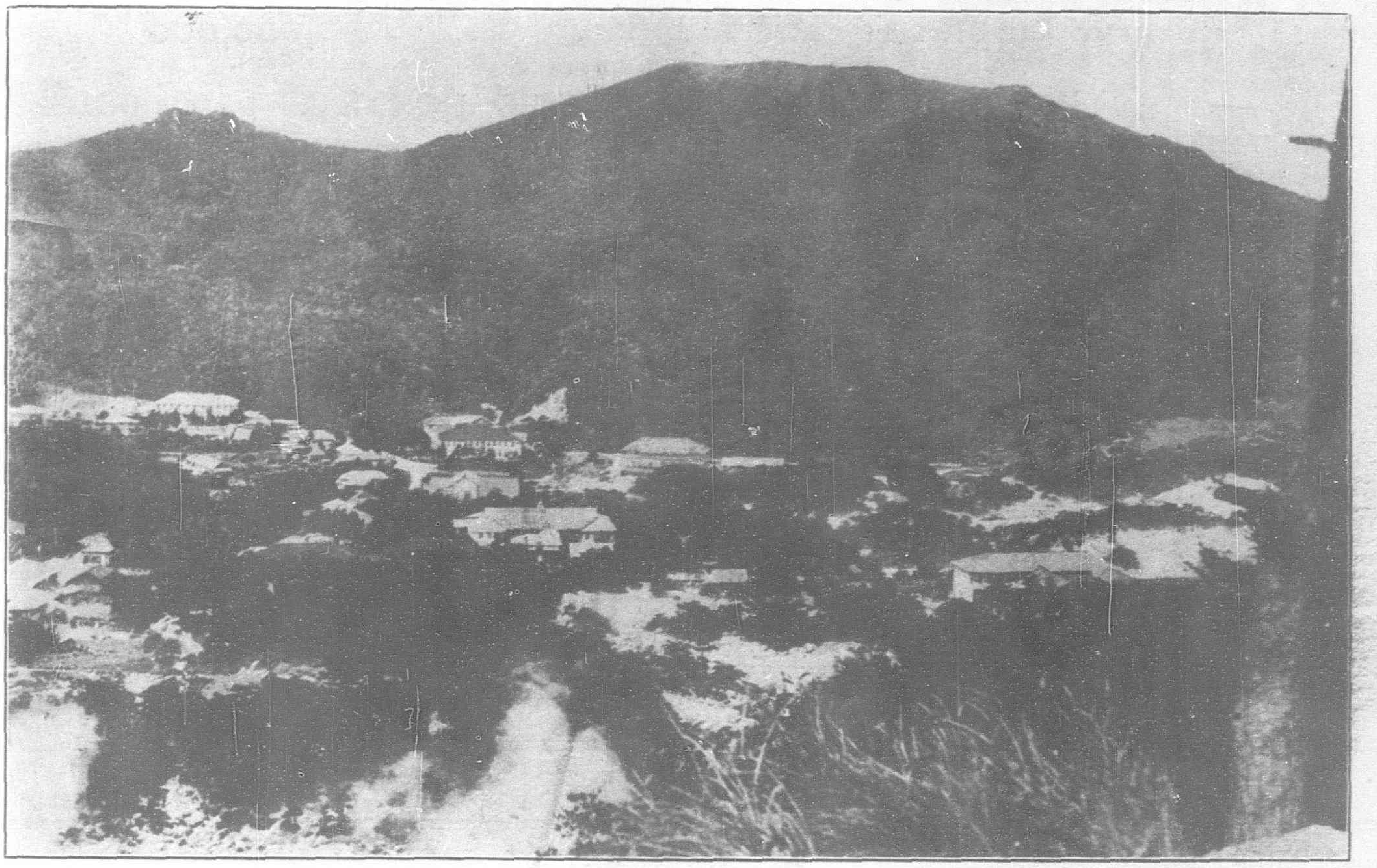

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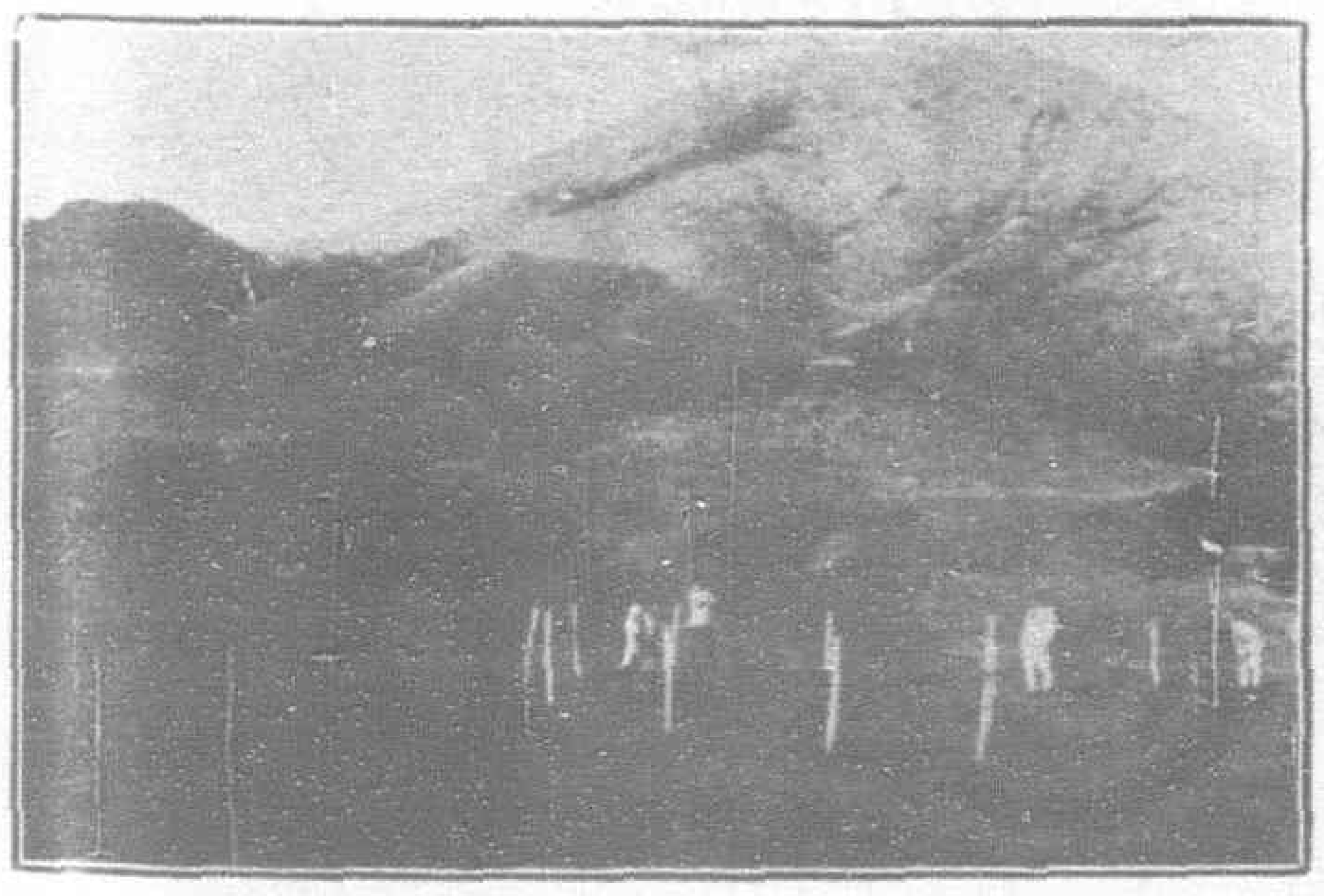
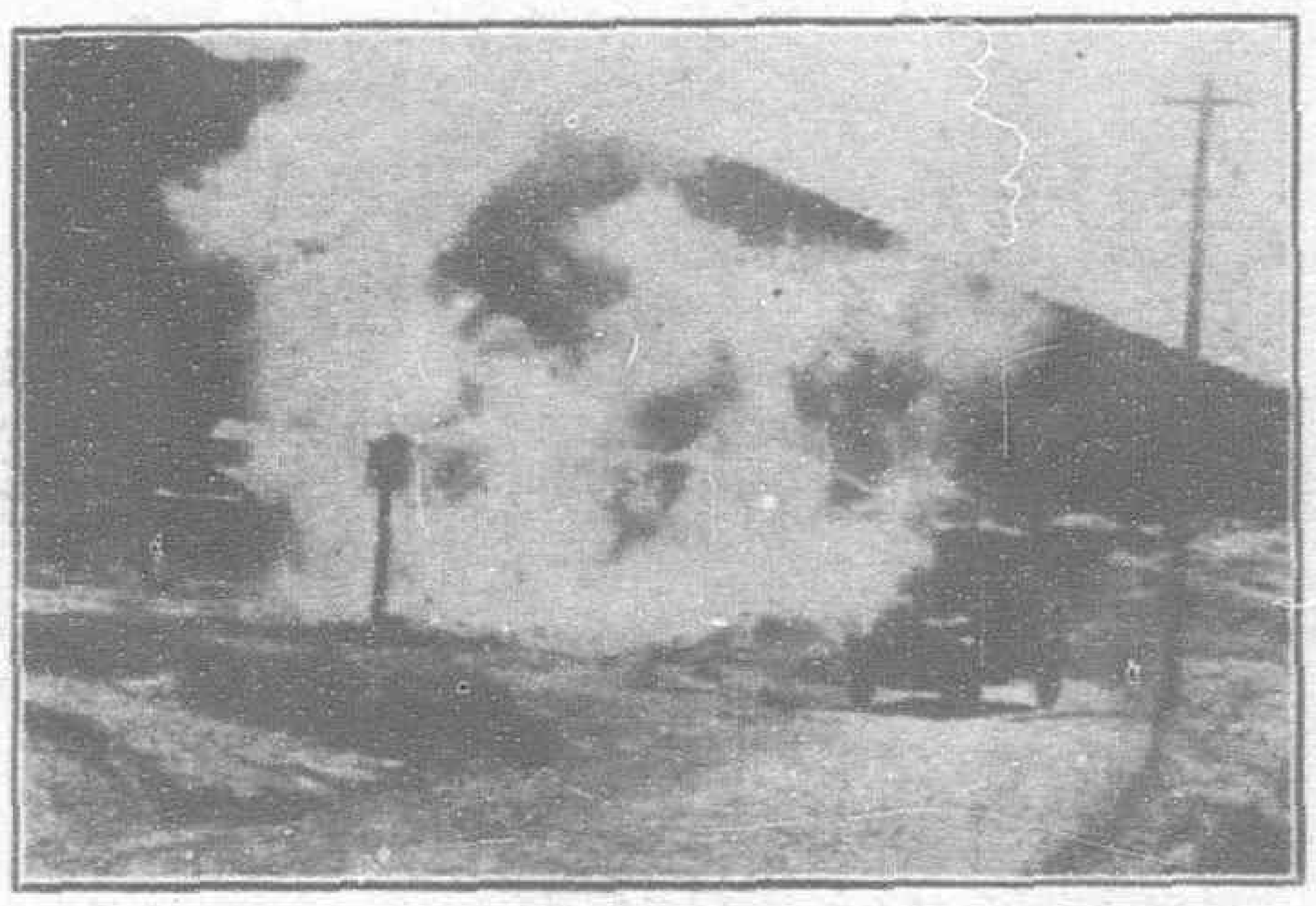
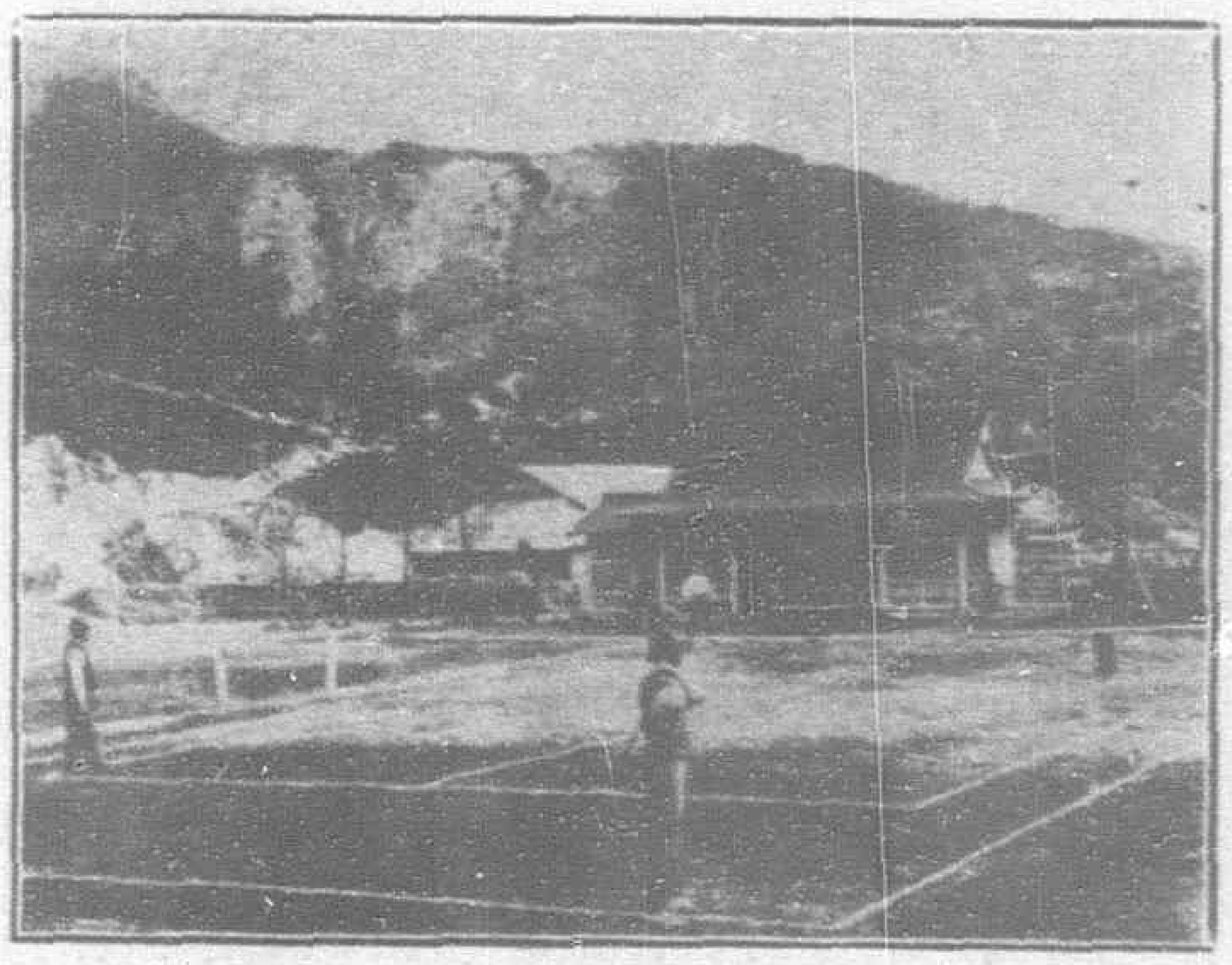


Golf Course



One of the Solfataras



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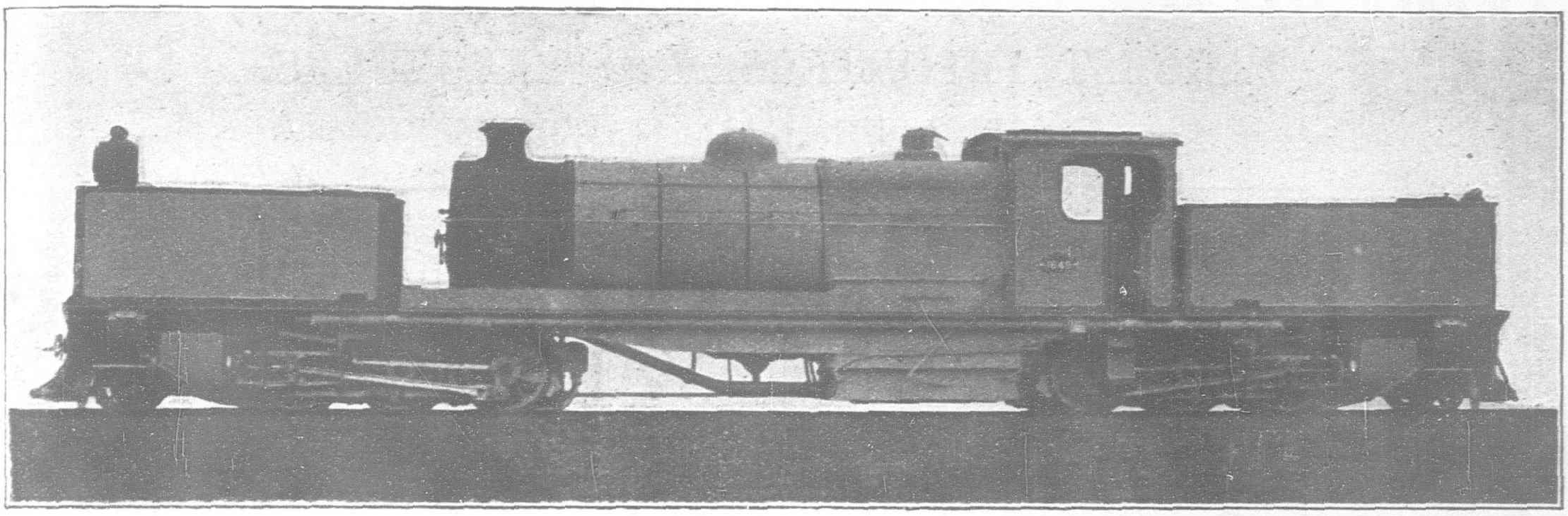

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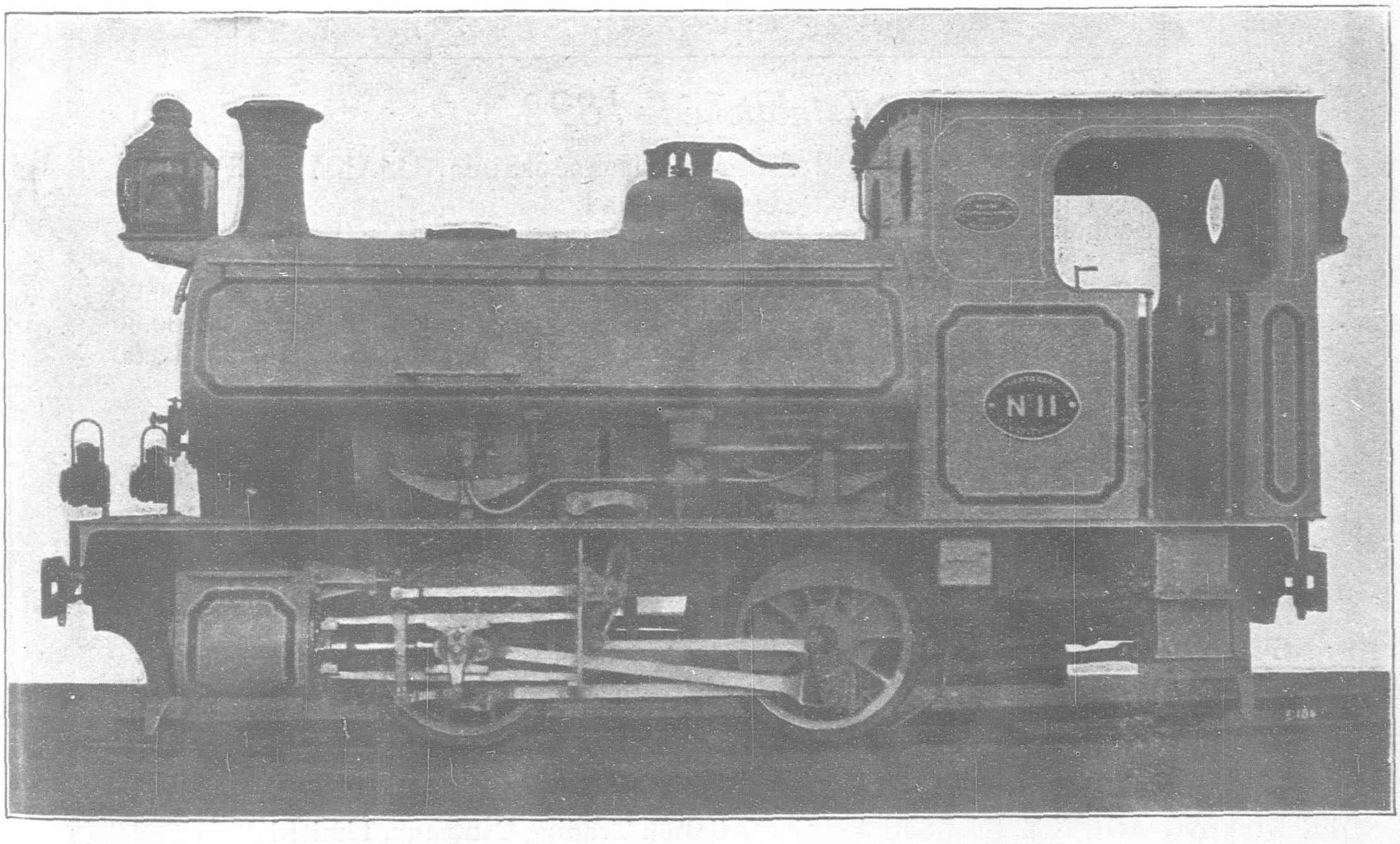

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Reserve Funds	Yen 26,825,000.00

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These are but two examples where slight causes have brought to life tremendous facts and laws, but between the initial cause and the fundamental establishment of these facts and laws there have intervened long hours of study and research.

It is upon such devotion that the progress of the world has depended.

In every generation there have been those who, heedless of wealth or ease, have given their whole lives, toiling unceasingly, for the uplift of humanity.

Even as you read this, in the extensive laboratories and research departments of the General Electric Company scientists and engineers are working untiringly over problems, the solution of which will make this a bigger, better and happier world.

G-E engineering is at your service through our nearest office or representative.

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There is a vast difference!

The "difference" in the "CAPSTAN" as compared to other brands is at once apparent to the smoker.

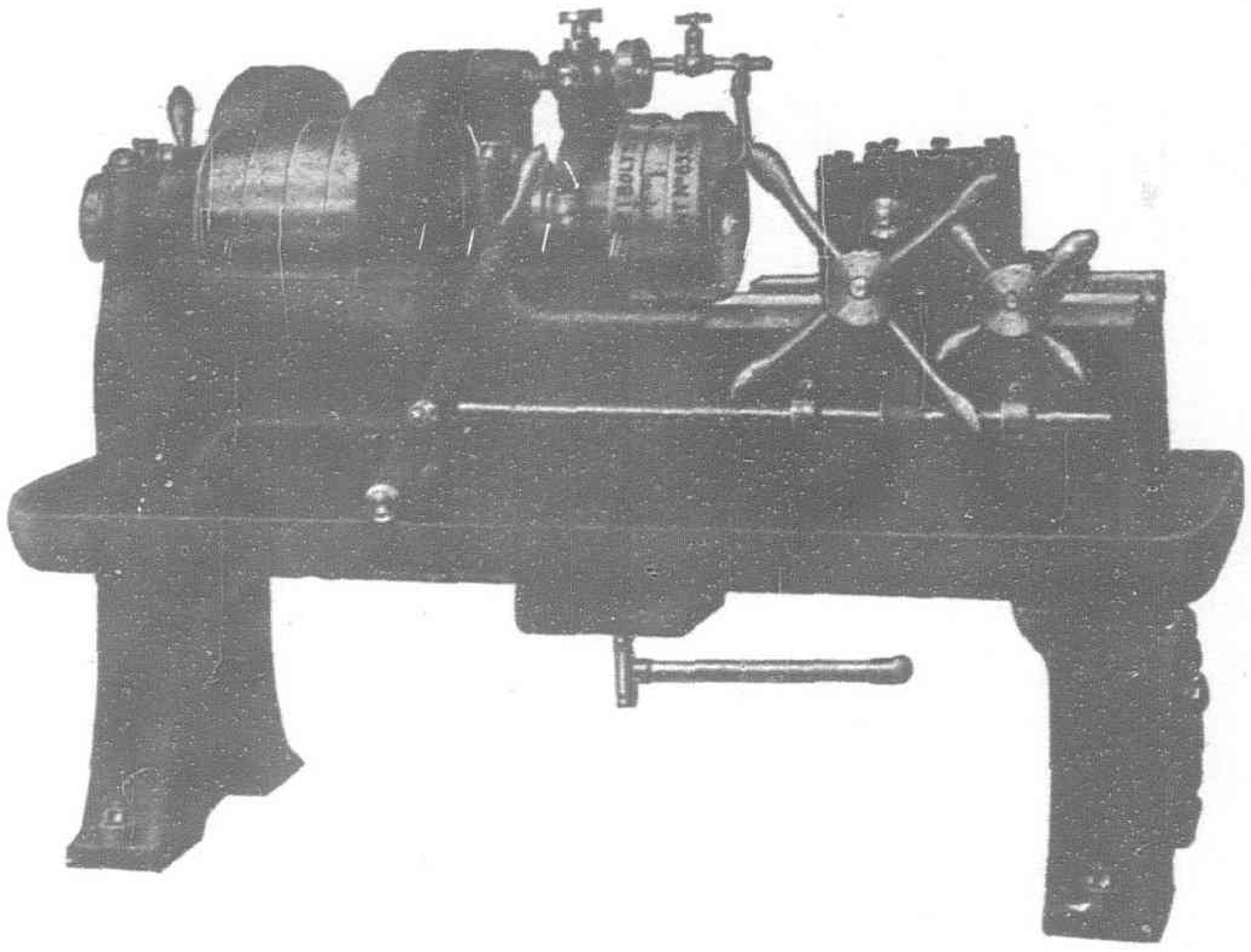
They are "different" in flavour and in quality. It is a "difference" that pleases.

The "Universal" CIGARETTE

"CAPSTAN"

This advertisement is issued by the British-American Tobacco Co. (China), Ltd.

Heap's Patent Screwing Machines



are made in all sizes, and suitable for dealing with all classes of work.

The illustration opposite shows our 2in. Patent Automatic Bolt Screwing Machine which is one of a complete line of Single and Multiple Head Machines specially designed for use wherever large quantities of Bolts have to be dealt with in the most expeditious and economical manner.

We will gladly advise you as to the most suitable machine for your particular class of work.

Catalogue free on request.

JOSHUA HEAP & CO., LTD.,

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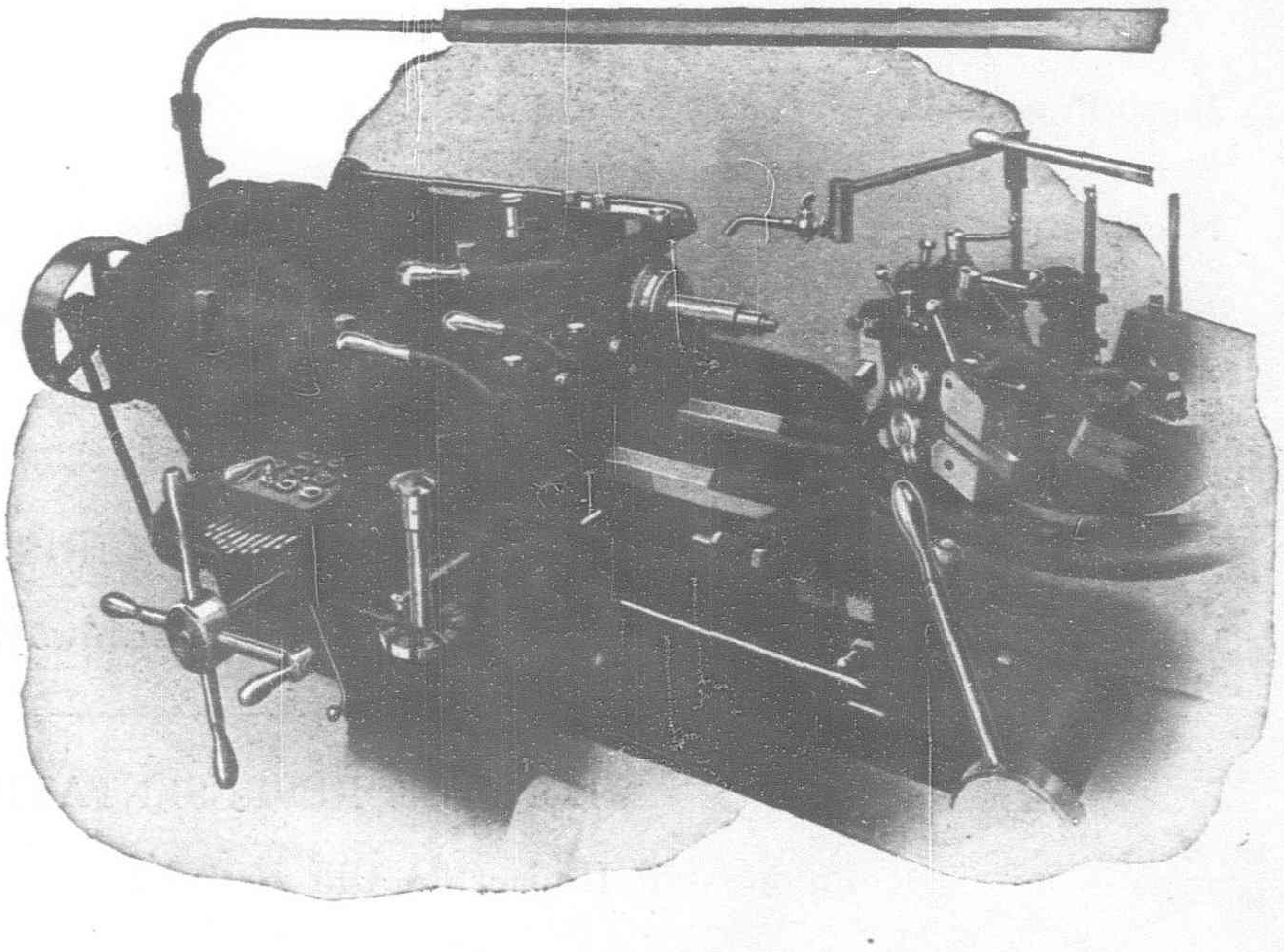
Output depends on *rigidity*. *Accuracy* depends on *rigidity*. The *essential point* of rigidity in a tool *is the rigidity* with which the *cutting edge* of the tool and *the work* are held with relation to each other. Rigidity in other particulars is non-essential.

The Flat Turret Lathe is designed with an eye single to being *rigid at the right points*. The flat turret, with its slide gibbed directly to the bed, the cross sliding head with a broad spreading bearing on the bed, the self-contained design of the tool holders, the arrangement of the stops, *and every other feature of the machine, work toward this one end*. And this end is reached to its degree *not attained by any other machine*.



Jones & Lamson Machine Company

9-10 Water Lane, London, England
Cable Address: "Turretorum" London

Springfield Vermont, U.S.A.
Cable Address: "Turret" Springfield, Vt.

THE BANK OF CHOSEN

Capital Subscribed - - - Yen 80,000,000
Capital Paid-up - - - Yen 50,000,000

Governor: S. Minobe, Esq.
Deputy-Governor: T. Kanoh, Esq.

Directors:
S. Suzuki, Esq. S. Kakei, Esq.
Y. Katayama, Esq.

Head Office: SEOUL (Korea)

FOREIGN DEPARTMENT: TOKYO

(All communications relating to correspondence arrangements and the Bank's general foreign business to be addressed to the Foreign Department)

Branch Offices:

Japan Proper—Tokyo, Osaka, Kobe, Shimonoseki
Korea—Chemulpo, Pyengyang, Fusan, Wonsan, Taiku, Chinnampo, Kunsan, Mokpo, Hoilyong, Chungjin
Manchuria—Antung, Mukden, New Town (Mukden), Dairen, Yingkow (Newchwang), Changchun, Harbin, Tiehling, Liaoyang, Ryojun, Kaiyuan, Chengchiatun, Szupingchieh, Fuchiatien, Kirin, Lungchingtsun
China Proper—Shanghai, Tientsin, Tsingtao, Tsinan
Siberia—Vladivostock, Alexandrofsky Port

NEW YORK AGENCY:

The City Investing Building, 165 Broadway, New York City

LONDON REPRESENTATIVE:

Palmerston House, 34 Old Broad Street, London, E. C. 2

Correspondents:

San Francisco, Seattle, New York, London, Paris and in other commercial centers throughout the world

International Banking Corporation

CAPITAL AND SURPLUS - - - U.S. $10,000,000.00

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LONDON OFFICE: 36 BISHOPSGATE, E.C.

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BATAVIA
BOMBAY
CALCUTTA
CANTON
CEBU
COLON
DAIREN
HANKOW
HARBIN
HONGKONG
KOBE
MADRID
MANILA
PANAMA
PEKING
RANGOON
SAN FRANCISCO
SANTO DOMINGO
SHANGHAI
SINGAPORE
SOERABAYA
TIENTSIN
TOKIO
YOKOHAMA

Commercial and Travellers' Letters of Credit, Bills of Exchange and Cable Transfers bought and sold. Current Accounts and Savings Bank Accounts opened and Fixed Deposits in local and foreign currencies taken at rates that may be ascertained on application to the Bank.

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N. S. MARSHALL, *Manager.*

1A KIUKIANG ROAD.

BANQUE DE L'INDO-CHINE.

Capital	**Frs. 72,000,000**
Reserves	**,, 70,000,000**

HEAD OFFICE: 96 BOULEVARD HAUSSMANN, PARIS.

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Bangkok
Battambang
Canton
Djibouti
Haiphong
Hankéou
Hanoi
Hongkong
Mongtze
Nouméa
Papeete
Peking
Pnom-Penh
Pondichery
Saigon
Shanghai
Singapore
Tientsin
Tourane

Bankers:

IN FRANCE: Comptoir National d'Escompte de Paris, Credit Lyonnais; Banque de Paris et des Pays-Bas; Crédit Industriel et Commercial Société Générale.

IN LONDON: The National Provincial and Union Bank of England, Ltd.; Comptoir National d'Escompte de Paris; Crédit Lyonnais.

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L. ARDAIN, *Manager.*

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(THE FIFTEENTH BANK)

TOKYO, JAPAN

Telegrams: "Jugo Tokio"

Capital Subscribed Y. 100,000,000 Capital Paid-up Y. 49,750,000 Reserve Funds Y. 23,900,000

***President*: The Hon. Iwao Matsukata *Vice-President*: Masayasu Naruse, Esq.**

***Managing Directors*: Yutsuha Sato, Esq. and Kanesato Aiko, Esq.**

***Head Office Manager*: Sei Usagawa, Esq.**

***Head Office*: No. 6, 7chome, Kobiki-cho, Kyobashiku, Tokyo.**

BRANCHES:

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THE

MITSUBISHI BANK,

LIMITED

CAPITAL SUBSCRIBED - Yen 50,000,000
CAPITAL PAID-UP - - - Yen 30,000,000

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Mr. Manzo Kushida

MANAGING DIRECTORS:

Mr. Kiyoshi Sejimo Mr. Takeo Kato
Mr. Toru Otobe

HEAD OFFICE:

No. 3 Yayesucho Nichome, Kojimachi-ku,
Tokyo, Japan.

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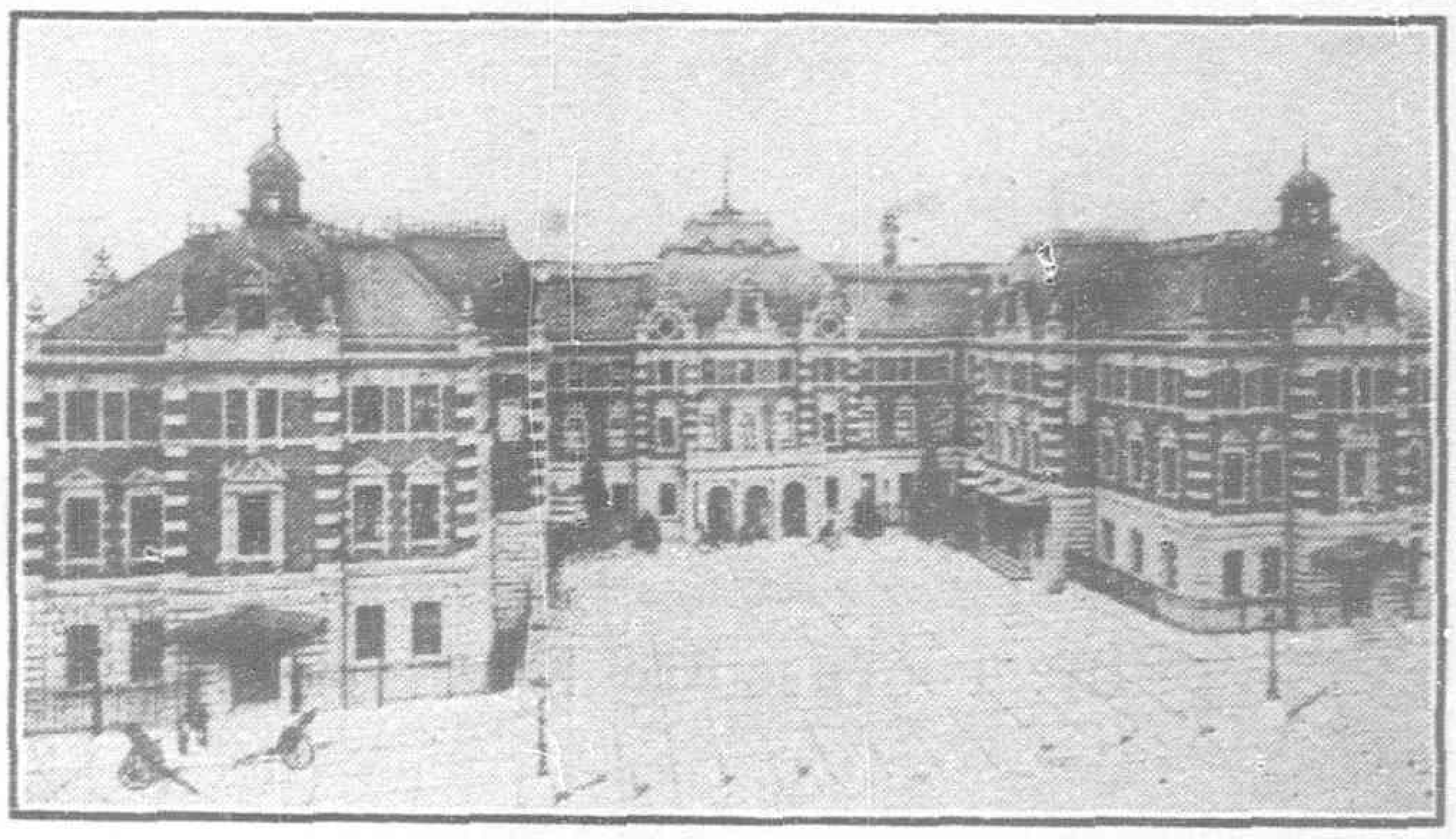

Capital Subscribed... ....Y. 100,000,000.00
Capital Paid-Up.................Y. 60,000,000.00
Reserve Fund (Feb. 1923) ...Y. 36,600,000.00

HEAD OFFICE:

No. 1 Suruga-cho, Nihonbashi-ku,
TOKYO

Branches:

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London Joint City & Midland Bank, Ltd.
Paris: Banque de l'Union Parisienne.
Comptoir National d'Escompte de Paris.
Hamburg: Commerz und Privat Bank.
Bombay: National Bank of India, Ltd.
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Industrial Bank of Japan, Limited

(NIPPON KOGYO GINKO)

Incorporated by Special Charter in 1902 to Encourage Foreign Investments

CAPITAL SUBSCRIBED - - - - - Yen 50,000,000

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OSAKA: KORAIBASHI
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JINI MATSUMOTO, Esq., Vice-President
K. IYANAGA, Esq., Director
T. IWASA, Esq., Director
KOZO MATSUMOTO, Esq.

AUDITORS:

NAGATANE SOMA, Esq.
KINTARO HATTORI, Esq.
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3.—Deposits and safe custody of valuables.
4.—Trust company business.
5.—Discounting of bills.
6.—Foreign exchange business.
7.—Other banking business sanctioned by the Minister of State for Finance in accordance with Law of Ordinance.

Hongkong and Shanghai Banking Corporation

Capital:	Authorised Capital	$50,000,000
	Issued and fully paid up ...	$20,000,000
Reserve Funds:	Sterling	£4,500,000
	Silver	$24,500,000
	Reserve Liability of Proprietors	$20,000,000

Court of Directors:

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Chairman

D. G. M. BERNARD, Esq.,
Deputy Chairman

A. H. COMPTON, Esq.
G. T. M. EDKINS, Esq.
Hon. Mr. P. H. HOLYOAK
W. L. PATTENDEN, Esq.
J. A. PLUMMER, Esq.
N. L. WATSON, Esq.
H. P. WHITE, Esq.

Head Office:
HONGKONG

Chief Manager:
HONGKONG . . . Hon. Mr. A. G. STEPHEN

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Sub-Agency: 9 Broadway

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DAIREN
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HANKOW
HARBIN
ILOILO
IPOH
JOHORE
KOBE
KUALA LUMPUR
LONDON
LYONS
MALACCA
MANILA
NAGASAKI
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PEKING
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RANGOON
SAIGON
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SINGAPORE
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(DAI HYAKU GINKO)

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YOKOHAMA BRANCH: Nos. 53-55 Honcho Shichome
OSAKA BRANCH: 28 Bingo-machi, Nichome
KYOTO BRANCH: Shijo Higashinotoin
SHINMACHI BRANCH: Shinmachi Dori Sanchome

President: K. IKEDA, Esq.
Managing Director: S. CHOH, Esq.

SUBSCRIBED CAPITAL - - - - -	Yen 25,000,000
CAPITAL PAID-UP - - - - - -	Yen 17,500,000
RESERVE FUND - - - - - -	Yen 8,094,340
DEPOSITS - - - - - - - - -	Yen 110,740,264

Transacts General Banking and Foreign Exchange Business. Conducts Trust Company Business

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OSAKA

Cable Address: "SUMITBANK" Established, March, 1912

(Successors to The SUMITOMO BANK)

Subscribed Capital ... Yen 70,000,000 Paid-up Capital ... Yen 50,000,000 Reserve Funds ... Yen 26,100,000

DIRECTORS:

Baron K. SUMITOMO	President
K. YUKAWA	Managing Director
S. YOSHIDA	,, ,,
N. YATSUSHIRO	,, ,,
K. NAKADA	Director
K. HORI	,,
T. KANOH	,,
S. IMAMURA	,,

Head Office: KITAHAMA, OSAKA, JAPAN

City Offices: Business Department in Head Office, Semba, Bingomachi, Kawaguchi, Nakanoshima, Dotombori, Temma, Nipponbashi, Uemachi, etc.

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Kojimachi

Telegraphic Address: TAIWANGINK

Telephones: 1060,1066,446,449 Marunouchi

Capital Subscribed	Y. 60,000,000
Capital Paid-up	Y. 52,500,000
Reserve Funds	Y. 11,780,000

President :

Kojuro Nakagawa, Esq.

Directors :

Gunji Kawasaki, Esq.
Kumematsu Morinaga, Esq.
Masumi Esaki, Esq.
Tadasu Hisamune, Esq.
Denkichi Takita, Esq.

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Taiwan :	Keelung, Tainan, Takow, and 11 others.
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K. NAKAGAWA, *President.*

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(FORMERLY THE FIRST NATIONAL BANK)

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Paid-Up Capital - - - -	Yen 43,175,000.00
Reserve Fund - - - -	Yen 37,500,000.00

Y. SASAKI, *President*

K. ISHII, *Managing Director.* Y. NOGUCHI, *Managing Director.* S. SUGITA, *Managing Director.*

HEAD OFFICE:

No. 1 KABUTO-CHO, NIHONBASHI-KU, TOKYO.

T. AKASHI, *Manager*

CITY BRANCHES:

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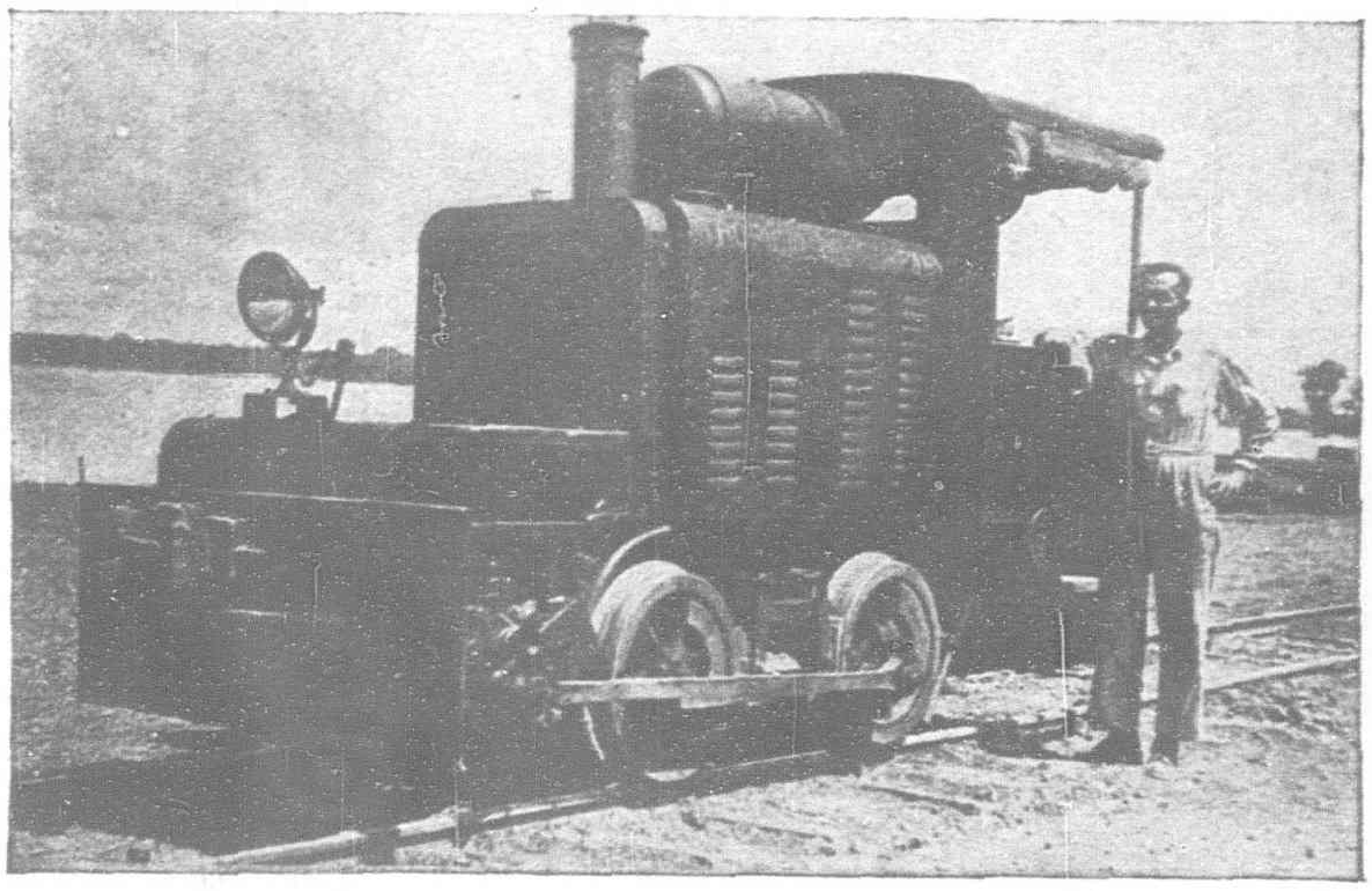

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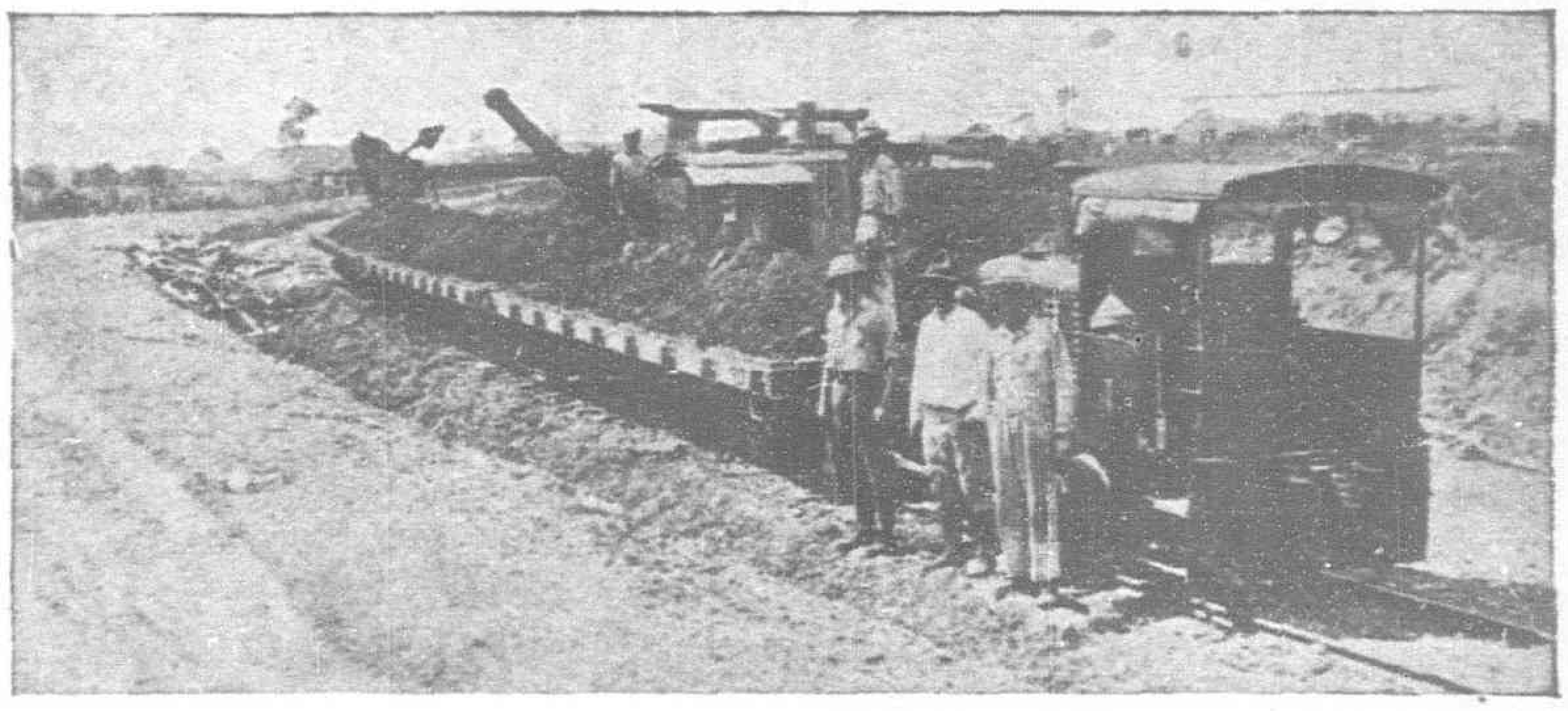

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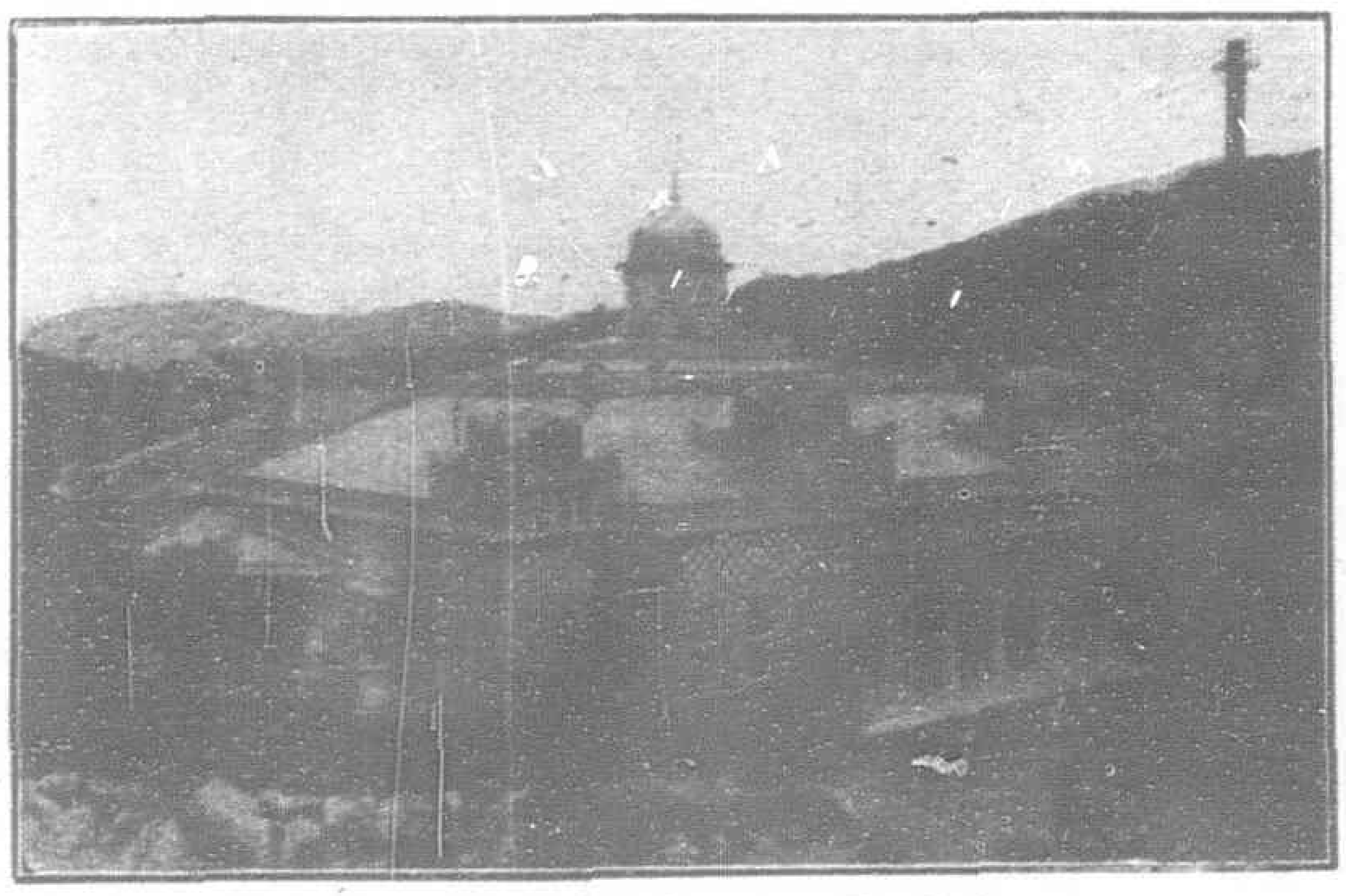
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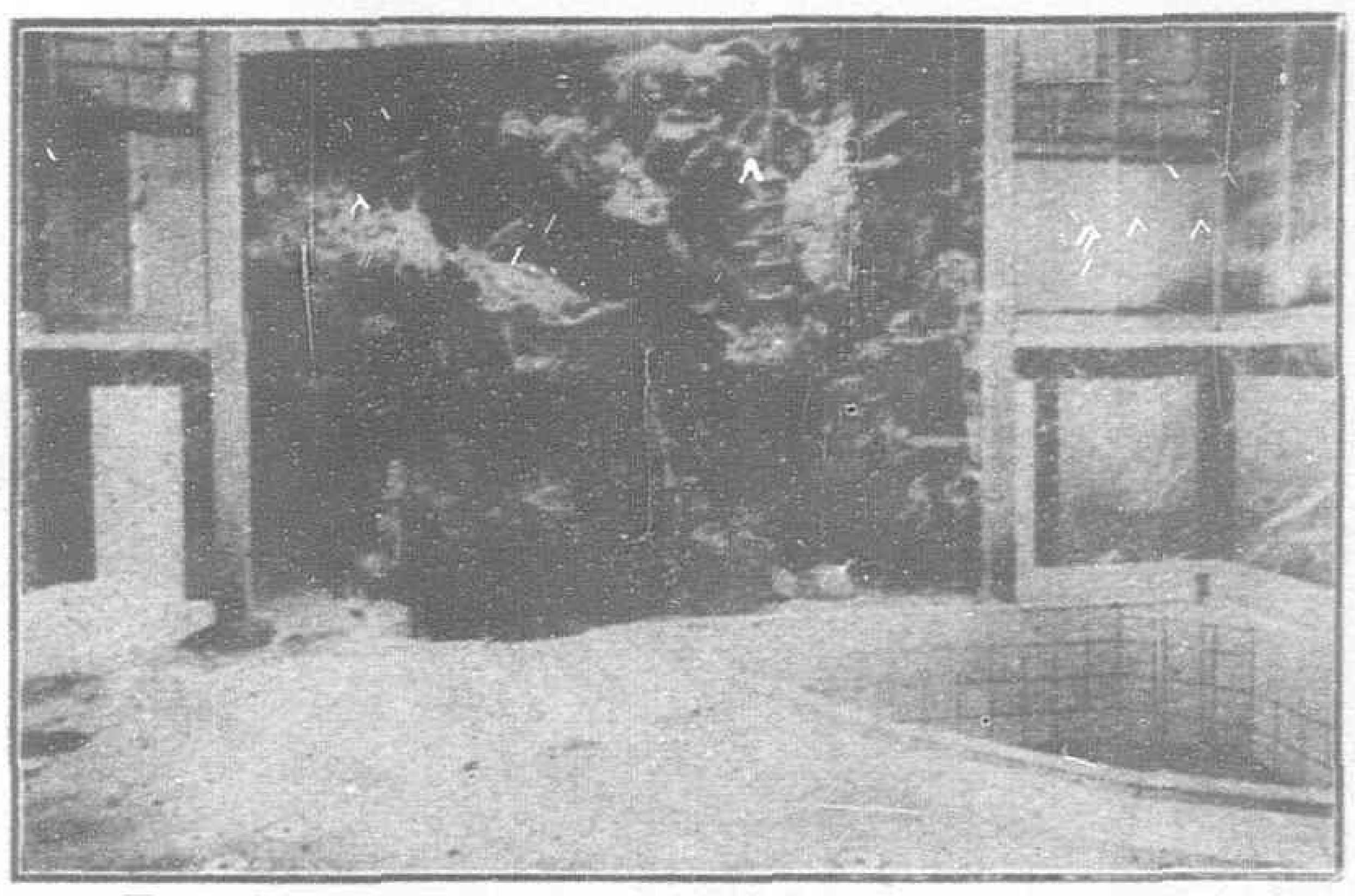
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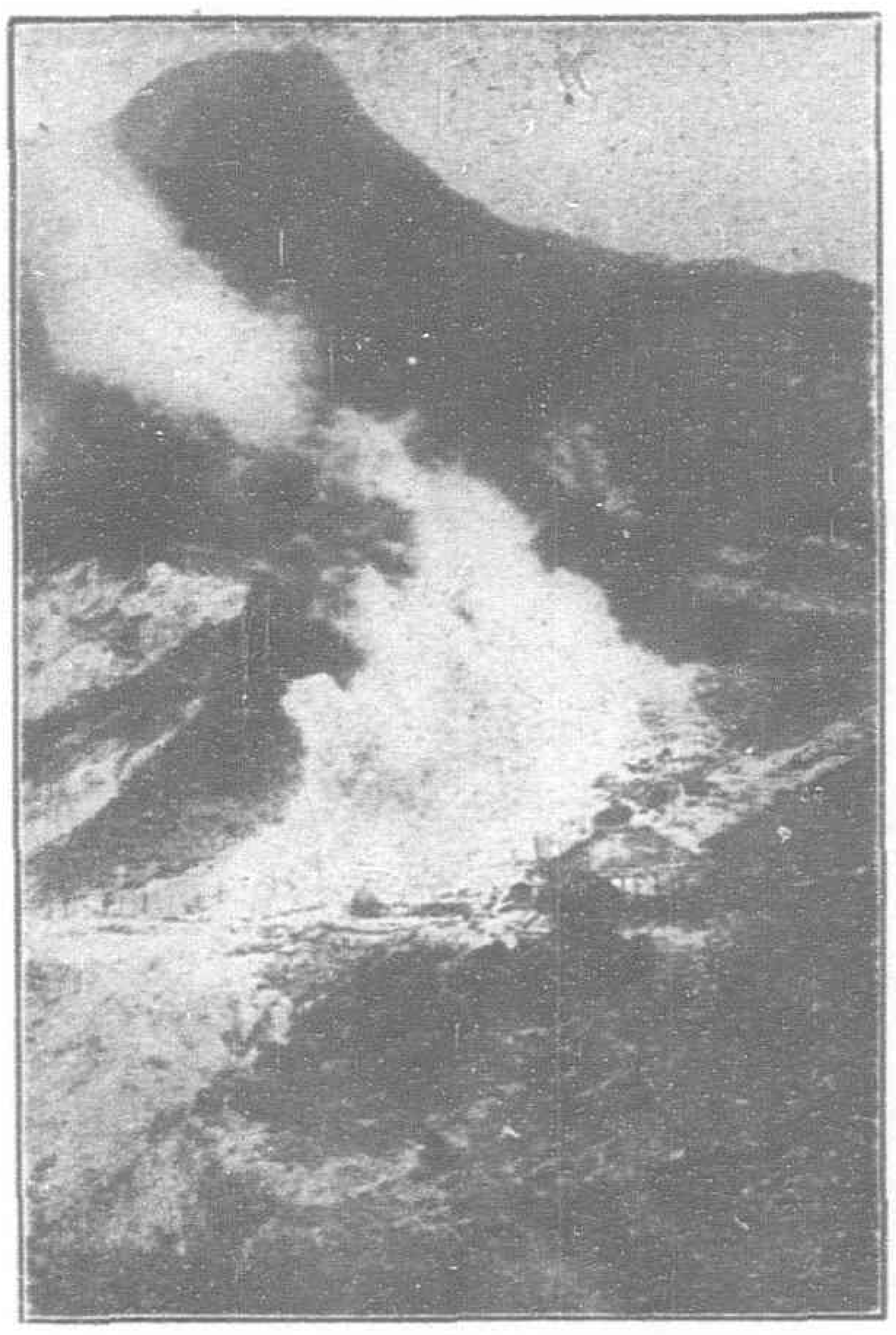
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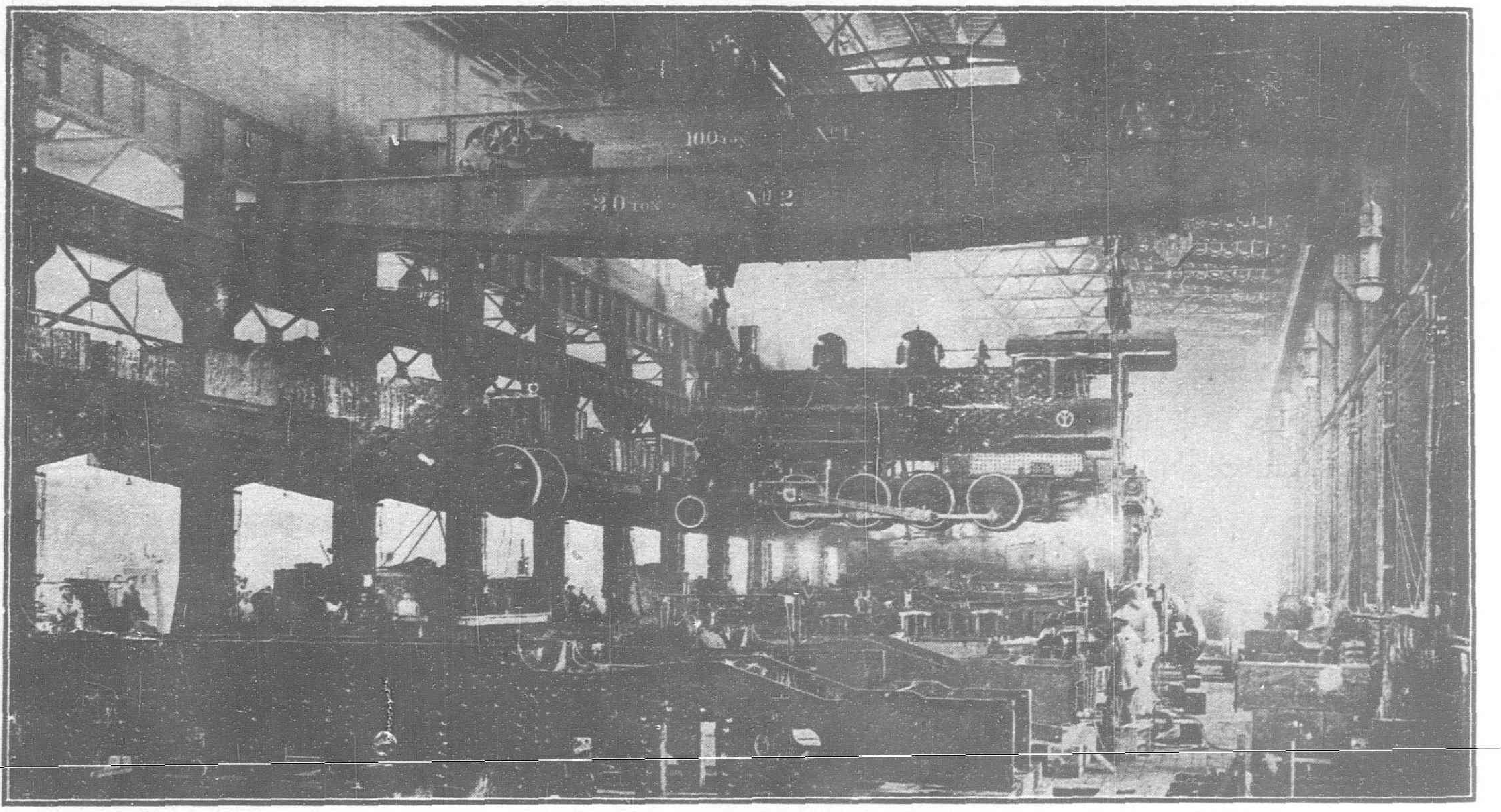

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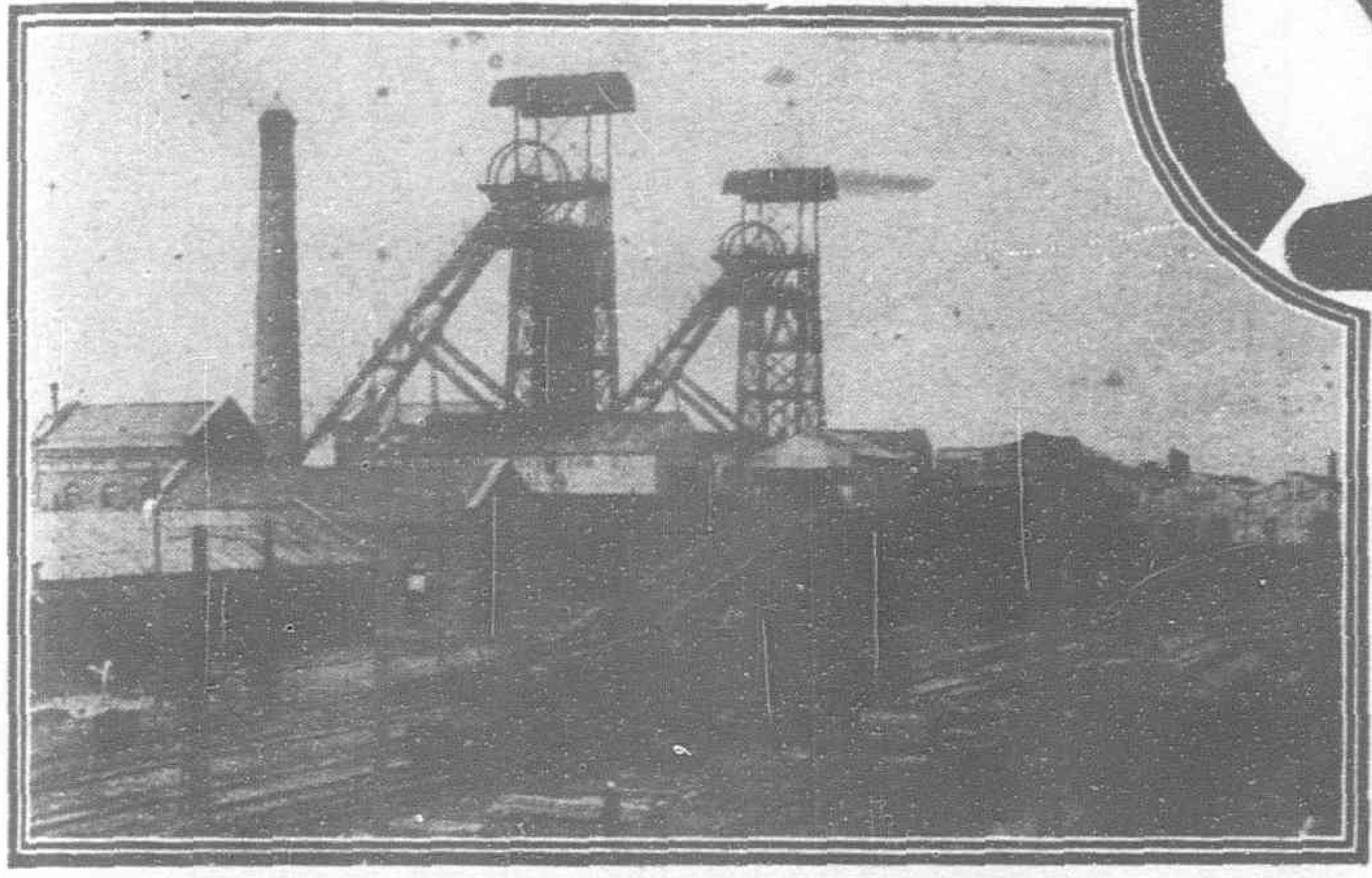

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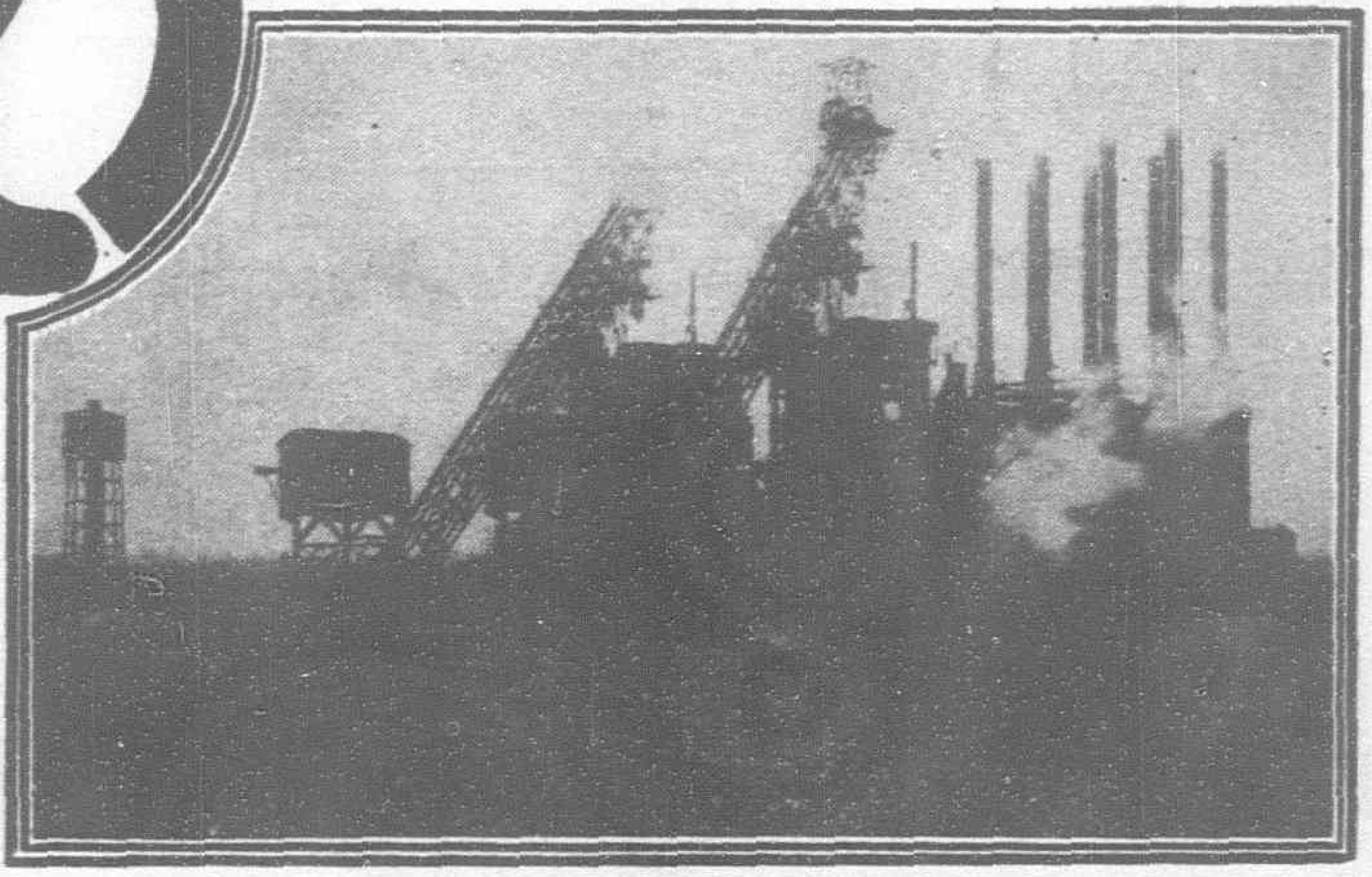

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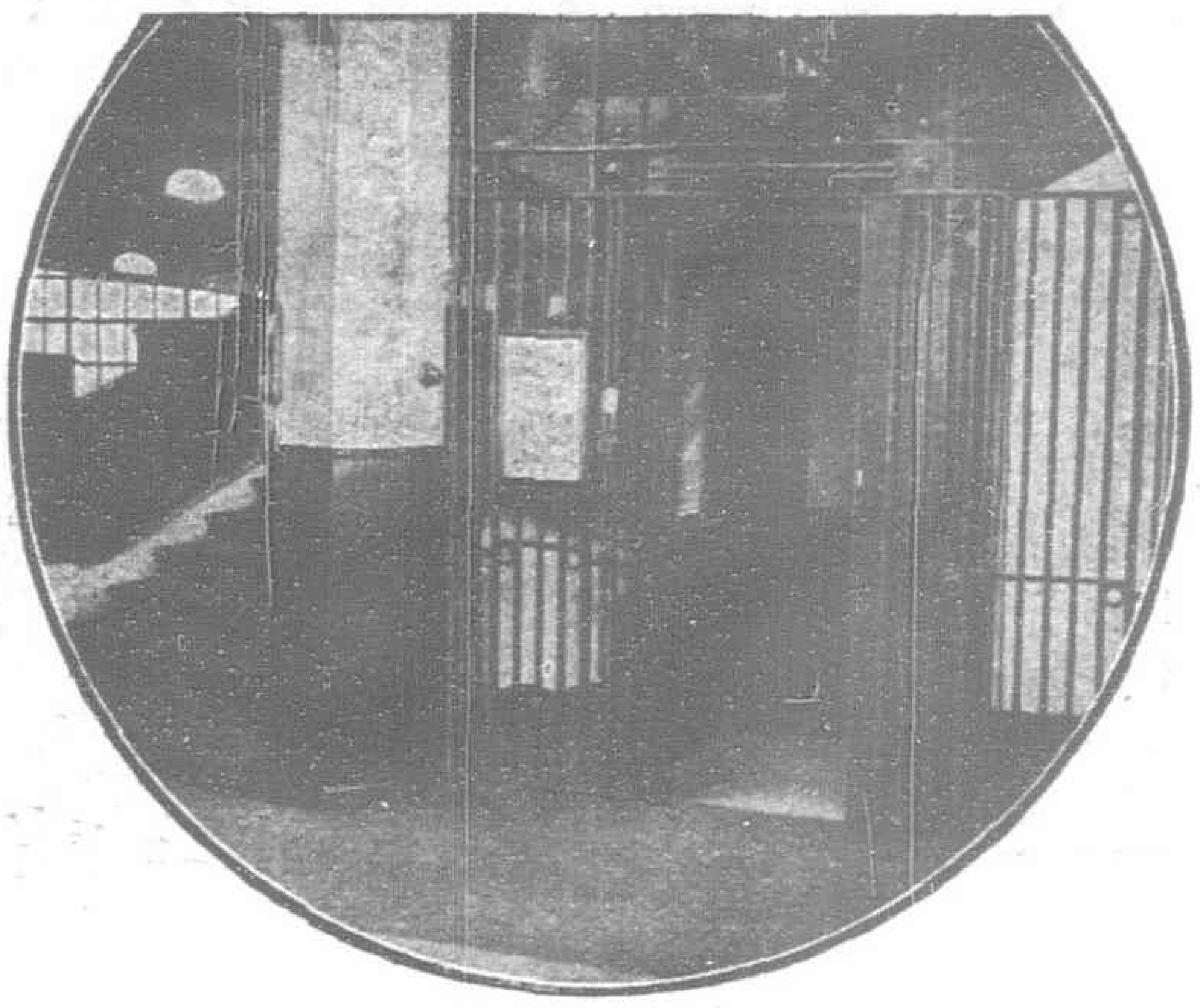

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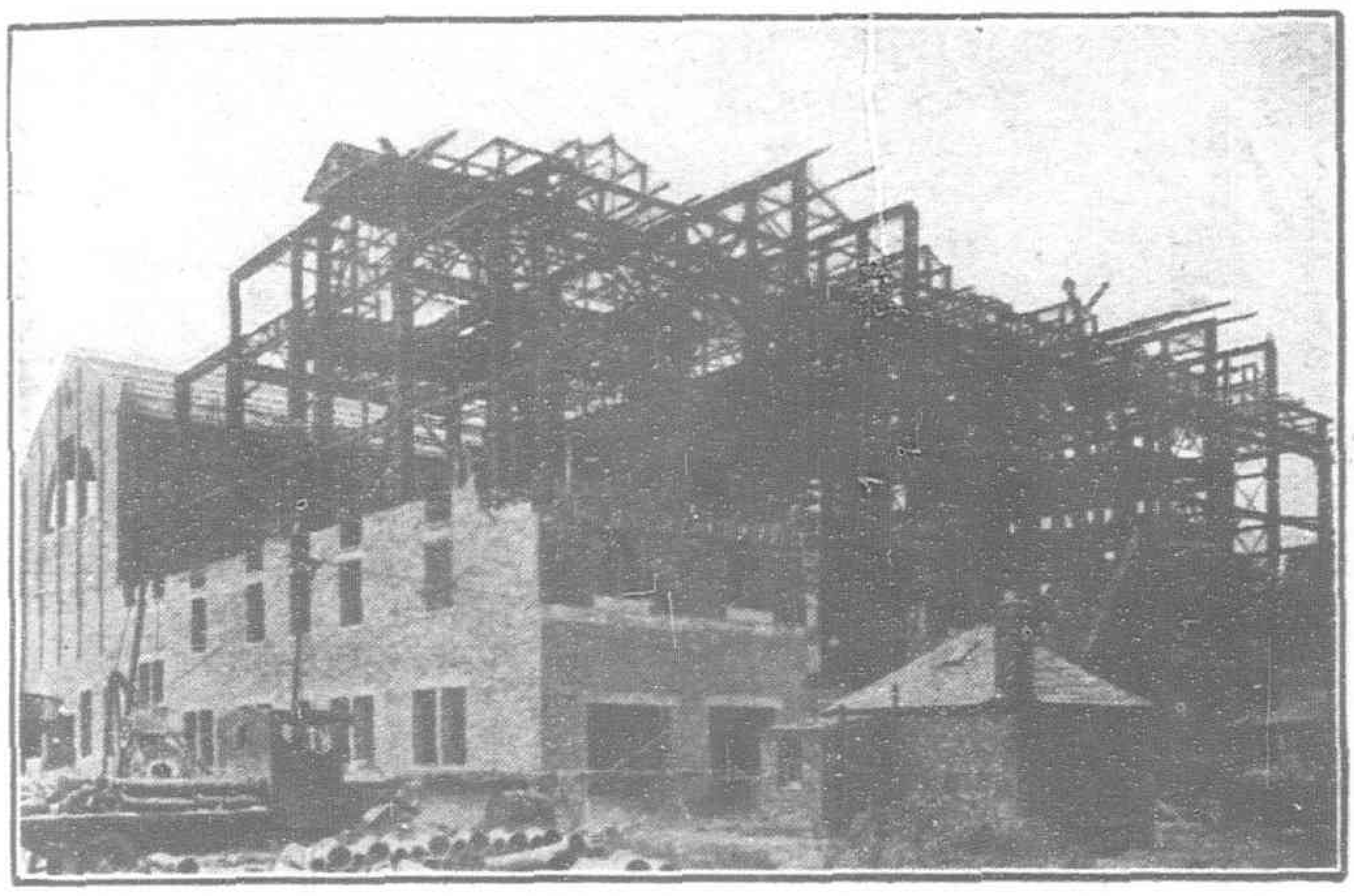

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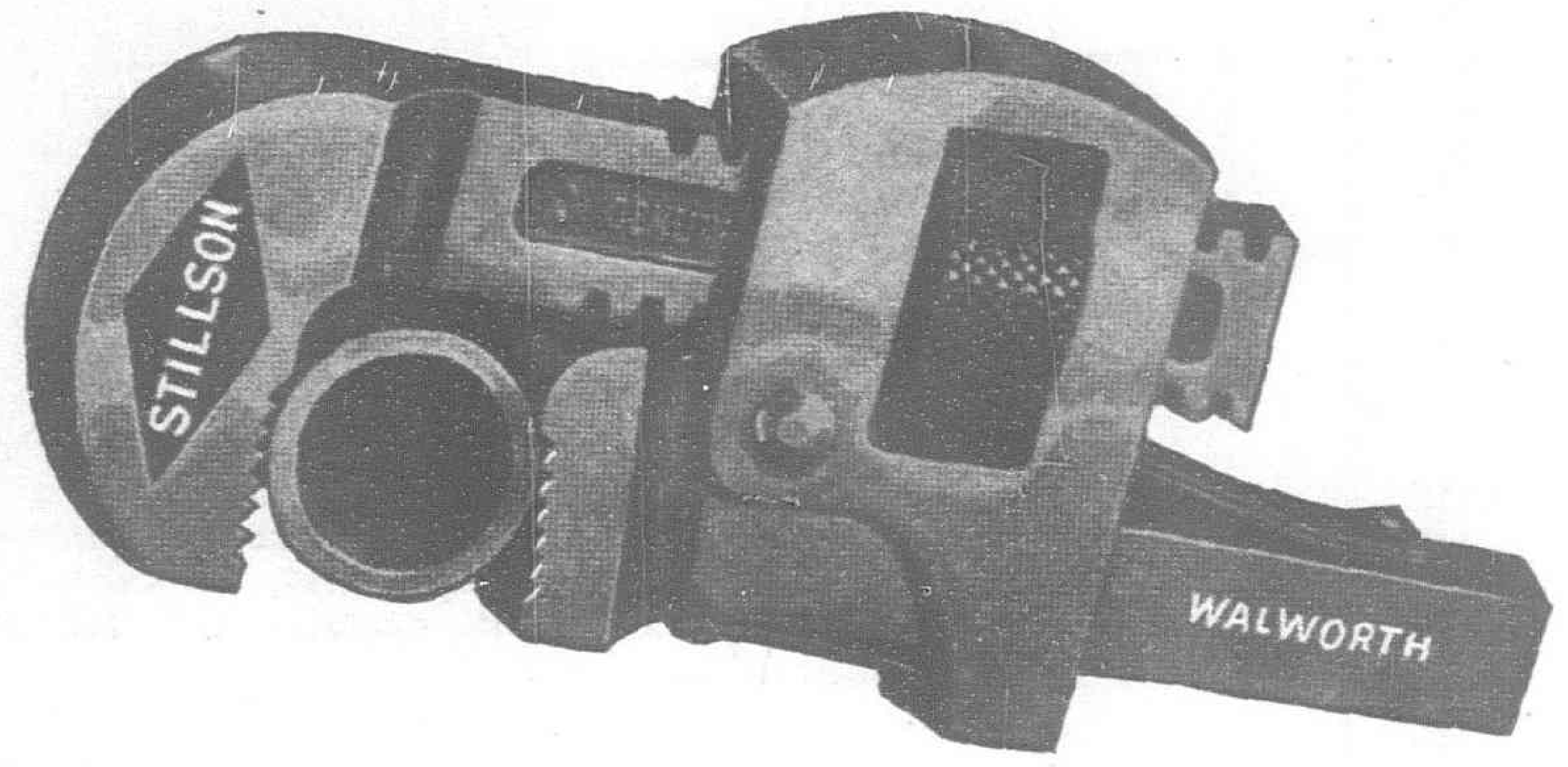

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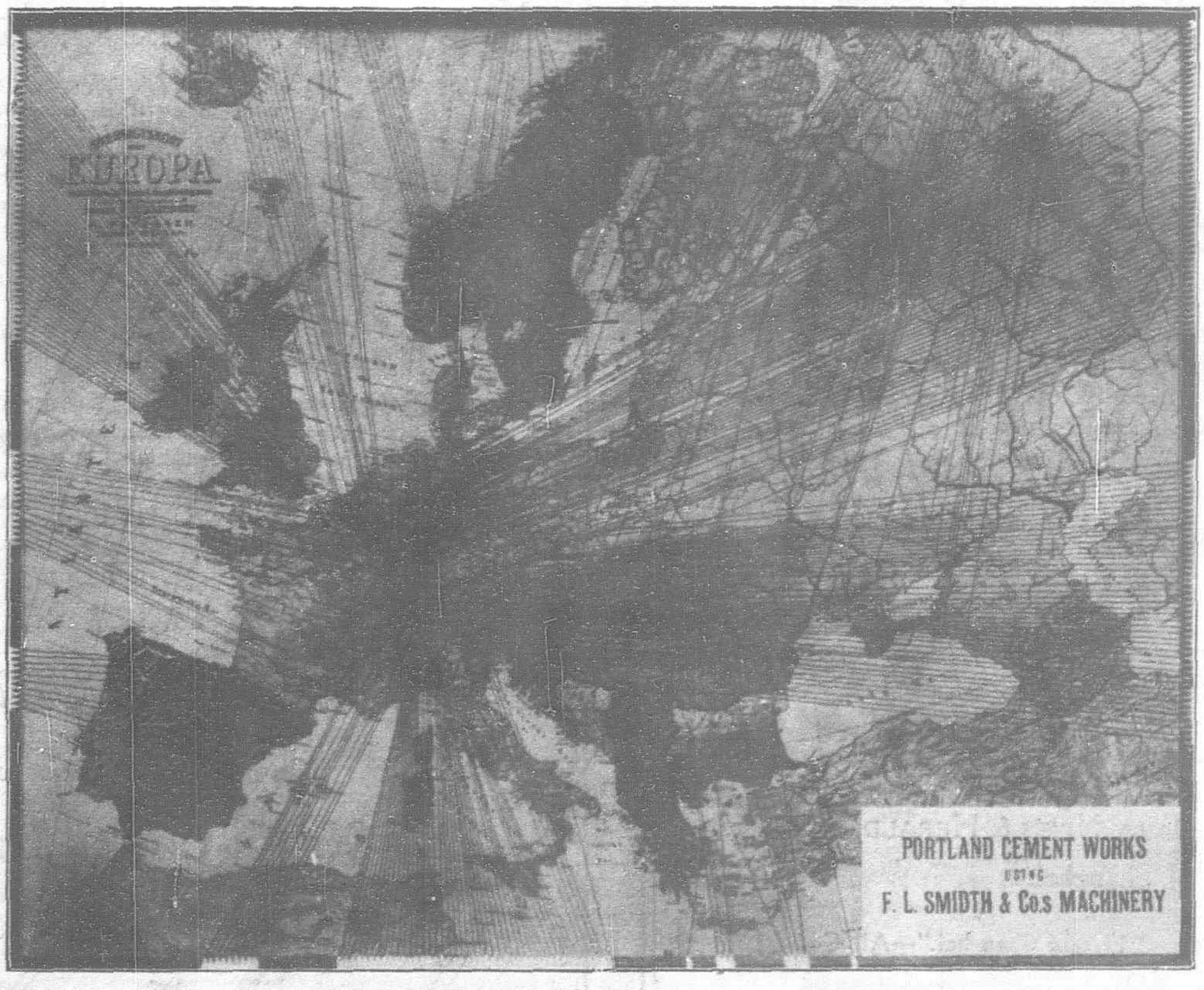

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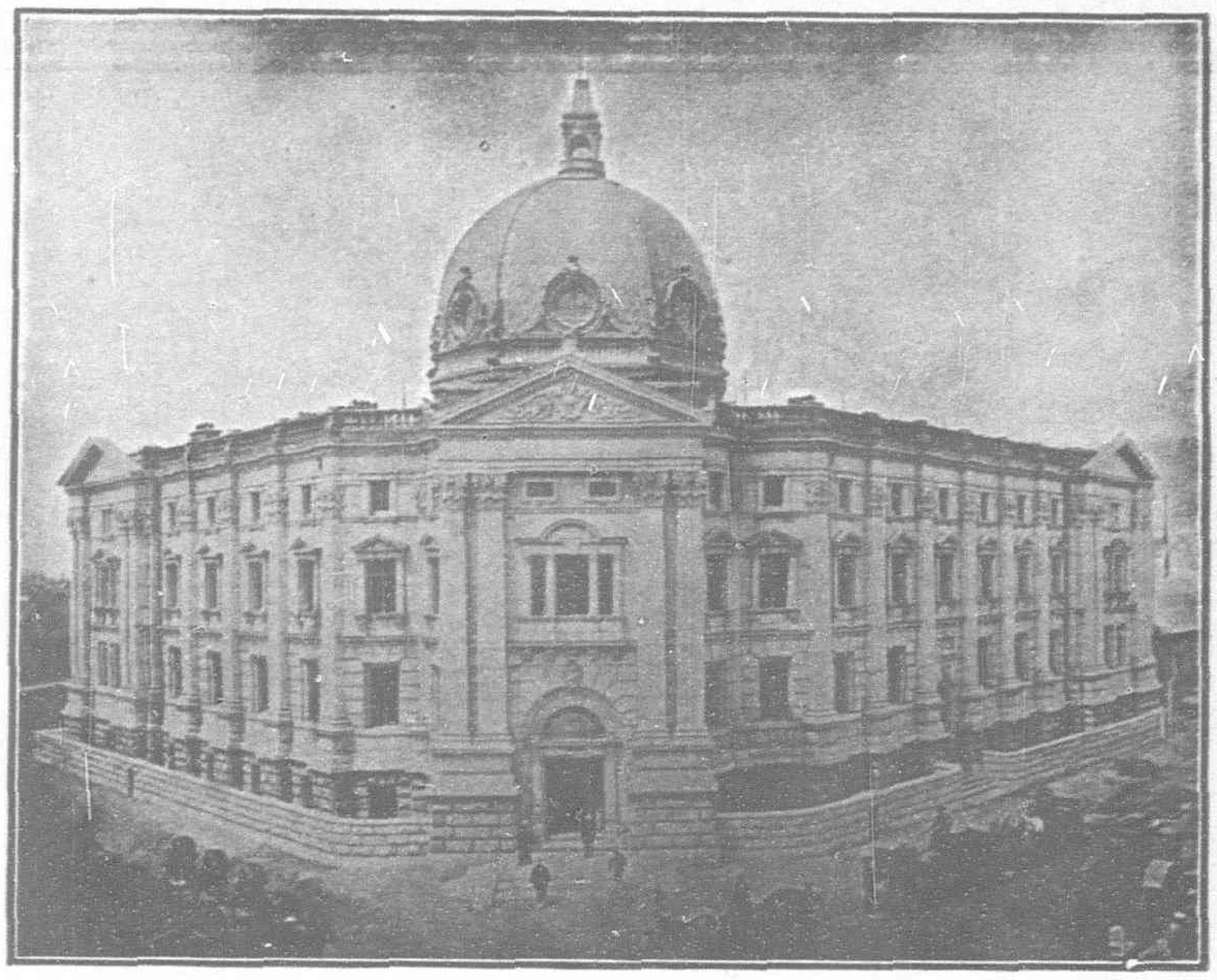

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ENGINEERING FINANCE COMMERCE

VOL. XX SHANGHAI, JANUARY, 1924 No. 1

When Is a Monopoly Not a Monopoly?

THE VAGARIES OF AMERICAN DIPLOMACY

The Radio Controversy

By Geo. Bronson Rea

BACK in the old Manchu days, somewhere about 1903, Prince Ching, then head of China's foreign relations wrote a note to Minister Conger in which he promised that in the event foreign capital became necessary to build the railway from Hankow into Szechuan, American and British financiers would be given the preference. At the same time, the British, French, Belgians and Russians were intrigueing at Peking to capture this particular concession and when the competition became keen and seemed likely to create international friction, the British group with the consent of its government, invited the others to pool their interests in a new company having for its object the creation of a monopoly of railway construction in the northern Yangtze valley. America could take no part in any combination with the odor of monopoly hanging round it, so our bankers ignored the invitation. The British, French and Belgians, however, came together in 1905 and organized the Chinese Central Railways, Ltd. Three years later, when the Szechuan railway was embraced in the British, French and German agreement to build the Canton-Hankow line, the American financiers demanded entrance into the combine, while President Taft sent a personal ultimatum to the prince regent stating that if the contract was signed without equal participation to the American group, he would consider it as an unfriendly act. We wouldn't have anything to do with a monopoly when invited by the British to participate but as soon as the others went ahead and had the agreement all ready for signing with the Chinese, we raised the issue of the "open door," equal opportunity and recognition of preferential rights, forcing our way theatrically into the very monopoly we would have nothing to with a few years previous.

In 1914, the Chinese government organized in Paris an international company for the financing, construction and operation of 10,000 miles of essential trunk railways, in which American, British, French and German interests held equal shares. This was an honest effort on the part of China to eliminate spheres of interest and put an end to the interminable squabbling over railway concessions by establishing the principle of international co-operation on a large scale. Each participant was to finance, build and equip 2,500 miles of lines. The American state department, however, in one of its inexplicable moods, declined to support the American participant, qualifying the contract as a monopoly; a violation of the treaties.

Two years later, an American firm supported by its minister at Peking, signed an agreement with the Chinese government for the financing and construction of several lines of new railways aggregating 3,000 miles in length, all of which conflicted with compromises previously entered into by China with other powers. We would not enter the door that was held open for us in 1914, in order to abolish competition, but two years later again theatrically raised the issue of our right to ignore China's committments with other powers. This contract for 3,000 miles, however, did not constitute a monopoly, although by reason of its dominating position in the American investment market, the corporation which took over the contract, could make it almost impossible for any independent concern to enter the field in competition. Two years later, finding the door hermetically sealed against further American railway operations in China, the state department initiated negotiations for the creation of a new consortium, another monopoly in fact, to do the very thing it had declared illegal and contrary to the treaties in 1914. What was denounced as a monopoly in 1914 became a highly desirable contract in 1916 and the principle was adopted as the basis of our diplomacy in 1918 in the formation of the present consortium.

In the meantime, China entered into other important contracts, one with a British concern for the erection of certain wireless stations, and a subsequent one with a secret clause attached, in which a Japanese concern obtained a monopoly of radio communications. Ignoring its obligations under these two agreements, the same group of Peking officials subsequently signed another radio contract with an American concern. Japan naturally protested against the execution of this agreement insisting upon the validity of its prior rights. In this she was joined by Great Britain and Denmark. The American government took the stand that the Japanese contract being a monopoly, was a violation of the "open door" principle and the Washington treaties, therefore void. Secretary Hughes following the precedent of Mr. Taft informed the Chinese government that cancellation of the American contract would be considered an unfriendly act. Japan has adhered throughout the controversy to the validly of the Mitsui contract, while America has just as firmly maintained that it is a violation of the "open door" principle.

Japan offered to settle the dispute by amalgamating its rights with the American company and operating the service under joint control. For awhile it appeared that this solution would be accepted, but sometime last autumn the American government reverted to its original position and declined to accept any compromise embracing joint control. Placed between two fires, the Chinese government has, in effect, asserted its sovereignty by declaring that all contracts are valid.

The American wireless rights have since gravitated by the usual financial paths under control of the Radio Corporation of America. This corporation has acquired all the preferred stock and sixty per cent. of the common stock of the Federal Telegraph of Delaware which took over the holdings of a company of the same name incorporated in California, including the $13,000,000 contract for the construction and operation of radio stations in China.

The federal trade commission now reports to Congress that the Radio Corporation of America maintains a monopoly of radio service by reason of its interlocking international agreements. If the findings of the federal trade commission are sustained it is difficult to see how any independent concern can hope to operate a radio service from China to America. The Radio Corporation may not hold a monopoly in China, but if it exercises a monopoly in America, the door is closed to any other company which might desire to take advantage of the principle of equal opportunity in China for trans-pacific communication.

Inasmuch as the American government has insisted upon the nullity of the agreement between China and the Mitsui Company, the report of the federal trade commission will materially strengthen the Japanese position. The report would seem to charge the American government with encouraging and supporting a monopoly of radio service in America while seeking to prevent

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any foreign company from enjoying a similar advantage in China. Under the treaties the position of the American government may be unassailable, yet if the report of the federal trade commission is true to fact, our moral position is extremely vulnerable. In the face of this report, it would seem that the sooner America and Japan comes together in some compromise on the China dispute that will establish joint control and co-operation, the better it will be for all concerned.

"At the present time," says the report, "the Radio Corporation has in operation communication circuits with Great Britain, Norway, France, Germany, Poland, Italy and Japan. It is expected that a station in Sweden will be completed and ready for operation within the next six months and that the station near Buenos Aires will be completed in the near future.

Continuing, the report says: "Because of the provisions of the various agreements the corporation has with foreign companies for service through the facilities of the Radio Corporation exclusively it is not believed that it will be possible for any other company in the United States to conduct an efficient transoceanic service. In fact, a group of newspaper publishers in the United States who sought to erect a station for the receipt of radio messages, after conducing experiments in this country, eventually built such a station at Dartmouth, Nova Scotia. This station now is being operated, its service being supplemented by virtue of an arrangement with the British Postoffice. The following members of the association operating such service are: *Chicago Tribune*, *New York Times*, *New York World*, *New York Herald*, *New York Tribune*, *Philadelphia Public Ledger*, *United Press*, *International News Service* and *Universal Service*. The association of newspapers is not exclusive and business for other newspapers is conducted at one cent a word."

The commission's report goes exhaustively into the history of radio development as a means of communication in the United States beginning with the formation of the Marconi Wireless Telegraph Company of America with a capitalization of $10,000,000 in 1899, down to the organization of the Radio Corporation of America by the General Electric Company, October 17, 1919. Discussing the hold the Corporation has upon international communications, the report says:

> "The Radio Corporation is the only concern now engaged in transmitting and receiving radio messages between the United States and foreign countries, and contents that in order to function properly it must of necessity secure a monopoly in this field. The company has secured a virtual monopoly and controls all the high power stations, with the exception of those owned by the government. In addition, it has entered into traffic agreements with the various foreign governments and radio companies, the majority of these agreements providing that all messages intended for the United States shall be transmitted only through the facilities owned by the Radio Corporation of America. Agreements of this character have been made with Marconi's Wireless Telegraph Company, Ltd., covering the British possessions, and the governments of Norway, Germany, France, Poland, Sweden and the Netherlands. An agreement of a similar character between the Marconi Company and the Japanese government was assumed by the Radio Corporation when it purchased the assets of the Marconi Wireless Telegraph Company of America and traffic by radio between the countries established. In 1921, the Radio Coporation entered into an agreement with Marconi's Wireless Telegraph Company, Ltd., a British concern, the Compagnie Generale de Telegraphie sans fil, a French concern, and the Gesellschaft Fuer Drahtlose Telegraphie m. b. H., a German concern, respecting radio traffic from South American countries, which was afterwards extended to Central American countries. Steps have been taken to establish service between Brazil, Argentina, Colombia, Venezuela and the United States. This agreement was made subject to the rights of the United Fruit Company in Cuba, Colombia, the Panama Canal Zone and Central America, and its agreement with the Radio Corporation whereby it agreed not to establish or operate stations for wireless communication outside the allotted territory.
>
> "The Federal Telegraph Company of California, which is engaged in a ship-to-shore communication service on the Pacific coast, in 1921 entered into a partnership agreement with the Chinese government, providing for the erection of stations in China and the establishment of a transoceanic service. This agreement was assumed by the Federal Telegraph Company of Delaware, which was organized by the old Federal Company and the Radio Corporation. An agreement between the various companies holding concessions in China was also proposed. The agreement was apparently not executed, and the correspondence with the navy department shows that the department would oppose any agreements of this character unless they were first approved by the respective governments. In a letter to the secretary of state dated December 16, 1921, Mr. Denby, secretary of the navy, emphasizes the importance of maintaining competition in radio communication to and from China. The possibility of a monopoly in other fields than that of service is also pointed out, as is shown by the following excerpt from the letter:
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> "The navy department fears that any commitment on the part of the government to an arrangement favorable to a monopoly by a single commercial company, though limited to a particular service, would but lend a means toward extending monopoly to other services, such as development and distribution of apparatus in general, and this is considered absolutely undesirable, particularly in the field of supply and service to ships.'"

The Radio Corporation's grip on the patents and devices necessary to handle the radio situation also is discussed at length. On November 20, 1919, the corporation entered into an agreement with the Marconi Wirless Telegraph Company of America whereby the corporation issued to the Marconi Company 2,000,000 shares of its preferred stock in exchange of the physical properties, patents, licenses and good-will of the Marconi Company. On the subject of the so-called cross license agreements the report of the trade commission has this to say:

> "The Radio Corporation has entered into agreements with the various companies which own or control practically all patents covering radio devices considered of importance to the art. The number of patents involved, approximates 2,000. Agreements of this character have been entered into with the General Electric Company, Marconi's Wireless Telegraph Company, Ltd., American Telephone and Telegraph Company and its subsidiary, the Western Electric Company, the United Fruit Company and its subsidiary, the Wireless Specialty Apparatus Company, The International Radio Telegraph Company, the Westinghouse Electric & Manufacturing Company, and the Radio Engineering Company of New York. With certain minor limitations, the Radio Corporation under these agreements has secured an exclusive divisible right to sell and use the radio devices covered by the patents involved or by patents which these companies may acquire before the termination of the agreements. The agreements with the American Telephone & Telegraph Company and the Western Electric Company are to terminate in 1930, while the remainder are to terminate in 1945. Provision is made for the mutual exchange of information relating to radio, and, in most instances the Radio Corporation has granted to the other company a license under its patents to make and use devices in the particular field in which the other company is interested."

* * *

An Assurance of Friendship

THE strong revival of the friendly feeling between America and Japan was dwelt on in an address delivered in the United States by the Japanese ambassador at Washington, Mr. Massanao Hanihara, who declared that the interests of the two nations are so nearly identical that both will gain advantage by working together in friendly co-operation, and that neither can afford to follow any other course, or even think of doing so.

Trade figures quoted by Mr. Hanihara show the increasing dependence of Japan upon the United States and of the United States upon Japan for trans-Pacific business. Between 1914 and 1922 the trade between the two countries increased from $146,600,000 to $684,000,000. Japan is bending all its energies to manufactures so that it may have exports with which to get the money to buy food for its teeming millions. In industrializing itself, and restoring the cities and regions devastated by the earthquake, Japan needs everything—steel, machinery and lumber—which goes into manufacturing and restoration work. These billions of dollars worth of materials she will buy largely from the United States. Even upon no higher ground than business, it would pay neither country to quarrel with the other, and this mutual interest is an assurance of continued peace.

* * *

Common Sense Wins

HOLLAND'S parliament, says the *Brooklyn Eagle*, saved the Dutch taxpayers about $50,000,000 by ousting a ministry and turning down the plan to create a much larger navy "for the defense of the Dutch East Indian possessions." Approximately the same sum is saved to British taxpayers, as after parliamentary defeat Premier Baldwin definitely abandons the notion of vast expenditures in the fortifications of Singapore, concededly in a magnificent position to command the Malacca passage and in large measure to dominate the waters of the Far East.

Now Holland is not afraid of the United States, and Britain is not afraid of the United States. The motive of the statemen who honestly thought it wise to increase naval and military defenses for the Netherlands with 50,000,000 subjects in their islands, and for Britain with her hundreds of millions in the islands and in India, was frankly if not fully expressed in discussion. It was fear of Japan.

It is a hopeful sign that calm-minded Dutchmen and calm-minded Englishmen refused to be scared. They are willing to have a sharp watch kept on Japanese proceedings, they will back up their leaders in resistance to encroachments, but they do not care to invite hostilities by a show of insulting force in a part of the world where the Japanese are naturally jealous of race prestige, and naturally sensitive about hints of occidental coercion.

Gee: What a Graft!

Sixty Million Dollar Gold Subsidy for 832,285 Tons of Philippine Sugar: Equivalent to 3½ cents a Pound—And Still They Lose Money!

By Evett D. Hester, Professor of Economics, University of the Philippines

EDITORIAL Note: Mr. Evett D. Hester, professor of economics in the University of the Philippines, gives us a very timely and interesting analysis of the insular sugar industry, presenting facts and figures which prove that the cane is planted and harvested by government loans, capitalized by government subsidy and marketed by virtue of federal protection, displacing in a fictitious home market an equal quantity of American capitalized Cuban product. In the event of Philippine independence the United States is bound by treaty to allow Cuban sugar a twenty per cent. preference over all foreign sugars including the Philippines. The wholly artificial conditions upon which the Philippine industry has thrived, cannot always endure. The end of subsidy and loans is at hand, an end of federal protection is not improbable and the Philippine industry must stand on its own bottom and the product forced into its natural market in Europe there to compete with European beet sugar. Under present conditions the Philippine industry cannot hope to compete and unless the cost of production is lowered and more efficient methods adopted, the sugar industry of the islands must perish. We pointed out when the present system of financing the sugar centrals was adopted that the venture could not succeed. There is only one guarantee for the safe and profitable operation of a central factory that has to advance funds to the farmers for the planting of a stipulated amount of cane for delivery at the mill. That guarantee is a mortgage on the lands of the farmer, who in the event of not living up to his contract with the central factory, faces forclosure and the loss of his property. As Mr. Hester points out, the debtor planters desire the control to rest with themselves or with the government which they can influence through politics. In the new scheme for saving the industry with outside capital they are asking in effect for a further extension of the principle upon which the industry has been wrecked; bonding without effective security or guarantees that they will live up to their share of the bargain. It is impossible.

Mr. Hester shows that during the period 1917-23 the tariff profit to Philippine sugar producers arising out of the free entrance of their product into the American market, amounted to $29,575,071. This constituted a free gift from the American people, taken out of their treasury and handed over to their Filipino wards. The amount of local or insular subsidization enjoyed by the same producers, Mr Hester places at $30,000,000 which we interpret as meaning the $20,000,000 capital invested by the government in the six government centrals plus the deficits incurred in their operation to date. These figures are illuminating and tell us that the sugar industry of the Philippines has cost the American and insular treasuries the round sum of $60,000,000 gold, equivalent to $730 a short ton or about 3½ cents a pound on the 16,645,705 cwt. of sugar produced and exported to the United States since 1917.

Before the war the sugar manufacturers of Cuba made a fair profit when they could produce sugar at two cents a pound, in some favored instances this cost was cut to a little over one cent. We have reason to believe that these costs have not materially changed, but granted that they have doubled, it would appear that the Philippine industry has been subsidized to date for an amount equal to the cost of production—and still they cannot make a profit. Sixty million gold dollars subsidy for a total production of 832,285 short tons of sugar is some philanthrophy! Gee: what a graft!

G. B. R.

The Philippine Sugar Industry

Since early in the nineteenth century Philippine sugar (cane) has appeared in export, becoming significant in the seventies at over two million English hundred-weight. There was a gradual increase from 1875 to 1895 with no fluctuations below the two million mark. In 1895 over seven million hundred-weight was exported. Between 1895 and 1904, due largely to public disorder, exportation dropped to an inconsiderable position. By 1905 a recovery had been made and the volume from that time to this has fluctuated between two and five million hundred-weight until 1922 when the eight million point was reached.

Relative to other Philippine exports, sugar exceeded 30 per cent. of all exports and held premier rank on a basis of value from 1855 to 1895. This relative importance was lost in 1896 and not regained until 1920 when the centrifugal product had replaced to a considerable extent the muscovado. In that year sugar assumed again first place among Philippine exports. Centrifugal sugar entered the export lists in 1914. Since 1920 it has constituted the bulk of all sugar exported.

With the exception of but ten years between 1855 and 1905, over 20 per cent., on a basis of value, of the Philippine sugar export has reached the United States. Not infrequently during this period the proportion exported to the United States exceeded 50 per cent. and in six years exceeded 60 per cent. The relative importance of the United States market declined considerably between 1895 and 1907. From 1908 until the present the average proportion sent to the United States has been 60 per cent. In 1922 over 78 per cent. in value of sugar exports went to the United States. The reason for the apparently stable United States market for Philippine sugar is two-fold: (1) favorable free entry as against foreign and Cuban sugar since 1913; and (2) the recent change from muscovado to centrifugal product limits the export of Philippine sugar to either the United States or Europe, effectively closing the Asiatic market. The first cause is undoubtedly the greater. Indeed, the second may well be looked upon as a result rather than a cause. By 1900 the United States began to limit its purchases to centrifugal and the shift in Philippine manufacture, muscovado to centrifugal, was a direct response—a necessary change in order to hold the United States market.

Federal Protection of Philippine Sugar.—Considering the facts—that very little American capital is interested in Philippine sugar production, that, on the contrary, American capital virtually controls the Cuban output, that the Cuban output is in excess of United States imports, that every pound of Philippine sugar entering the United States forces a pound of Cuban sugar to the less favorable European market—it must be apparent that free entrance of Philippine sugar while Cuba is held to a stiff duty, constitutes a deliberate and politic protection accorded the Philippines against the interest of American capitalists. The schedules of tariff follow. They apply to 96° centrifugal sugar although several lower schedules hold for 70° to 90° products.

(*a*) Underwood Tariff, October 31, 1913, to May 27, 1921:
  (1) $1.26 a cwt. against foreign countries, except Cuba.
  (2) $1.00 a cwt. against Cuba.
  (3) Free for Philippines.
(*b*) Emergency Tariff, May 28, 1921, to September 22, 1922:
  (1) $2.00 a cwt. against foreign countries, except Cuba.
  (2) $1.60 a cwt. against Cuba.
  (3) Free for Philippines.
(*c*) Fordney Tariff, September 23, 1922, to date:
  (1) $2.21 a cwt. against foreign countries, except Cuba.
  (2) $1.76 a cwt. against Cuba.
  (3) Free for Philippines.

The increasing monetary value to Philippine producers of free entrance to the United States market is tabulated below.

TABLE I.—*Showing United States Tariff Advantage to Philippine Sugar Producers.*

Year	Exportation to United States 96° centrifugal cane sugar	Tariff rate against foreign countries except Cuba	Tariff profit to Philippine producers as compared with foreign producers.	Tariff rate against Cuba.	Tariff profit to Philippine producers as compared with Cuban producers.
	cwt.	*dollars per cwt.*	*dollars*	*dollars per cwt.*	*dollars*
1917-1918	1,392,111	1.26	1,754,060	1.00	1,392,111
1918-1919	562,396	1.26	708,619	1.00	562,396
1919-1920	907,016	1.26	1,142,840	1.00	907,016
1920-1921	3,573,390	1.26	4,502,471	1.00	3,573,390
1921-1922	5,232,231	2.00	10,464,462	1.60	8,371,569
1922-1923	4,978,561	2.21	11,002,619	1.76	8,762,267
	16,645,705		29,575,071		23,568,749

Table I indicates the possible maximum and possible minimum advantage accruing to Philippine producers, through their ability to enter their commodity free of duty into the highest sugar market of the world. The maximum is arrived at by taking advantage of the duty against foreign countries, except Cuba, which amounts to $29,575,071 for the six-year period, 1917 to 1923. The minimum is arrived at by taking advantage of the lower duty against Cuba, which amounts to $23,568,749 for the same period. The actual advantage lies between these points, probably nearer to the maximum. For conservative estimation the norm, $26,500,000, may be taken as a sure total momentary advantage enjoyed by the Philippine producers during the period 1917 to 1923.

Local Subsidization.—It may be considered that the federal protection extended to Philippine sugar would have in itself constituted sufficient encouragement to the production of centrifugal sugar in the islands. Such, however, was not the case. Muscovado sugar had required little capital and small technical efficiency, whereas centrifugal sugar was found to necessitate heavy investment and expert management. The production of modern elaborated agricultural commodities requires in notable degree industry, ingenuity for management, and a fund of savings for investment. The islands possessed, of these three requisites, the industry, but neither of the other two. Foreign capital was diverted in Europe by war and disorder, in America by the absorption of alien-held securities thrown on the market because of war, and by post-war industrial impetus. Entrance of foreign capital was, moreover, discouraged by strictly limited land laws enacted, be it said, by the early, American, and absolute Philippine commission. But, although the Philippine islands was in possession of no surplus personal wealth for the capitalization of centrifugal mills during the war and post-war years, the extremely favorable balance of trade drew heavy revenues to the insular government. These revenues stacked up annually to twice the average yearly budget. Much of them was expended in extension of a theretofore economical governmental machine. Still there remained an excess. The paucity of modern industries, the improbability of individual initiative undertaking them, combined with the political value of a treasury surplus led the local government into a strong and unresisted temptation toward the fantasy of government ownership. Railroading, coal, petroleum, cement, were undertaken on a national ownership basis. Incontinent loans for the building of cocount oil and sugar mills were made. These operations headed up in a National Development Company for mineral industries and a National Bank (92 per cent. government owned) for agricultural and commercial loans. When, under these ambitions schemes the actual surplus was early consumed, resort was had to the entirely reprehensible act of removing the gold reserves behind the Philippine currency from safe American depositories and adding them to the capital of the National Bank.

In such manner, it became possible for government to furnish some $20,000,000 as against the planters $3,000,000 for the establishment of six sugar centrals. During the period 1918 to 1920 these centrals were built and largely put into operation. Government investment in them was secured by mortgages of the centrals and the planters' lands—mortgages confessedly non-collectable. To date the capital and interest have not been satisfactorily liquidated. In the financial management of the centrals, there had by 1922 been incurred deficits of $4,000,000. In 1921 the National Bank to protect its interest took over the management of the mills and organized the Philippine Sugar Centrals Agency to consolidate and economize in operations.

As to the production of sugar, the centrals to-day rank a success; as to financial management, they have been a complete failure and the government has until very lately lost on every unit of sugar produced. Only the planters may have profited as they have been in a position to throw the bulk of capital cost on to the government.

The amount of local subsidization enjoyed by Philippine producers of centrifugal sugar, around $30,000,000, is about equal to a yearly budget of the insular government. Moreover, the amount is equivalent to more than one dollar out of six of revenues received from all sources by the government during the years 1918 to 1922. It is doubtful if any government, other than that of the Philippine islands, has in modern times devoted in proportion to its income so liberal an aid to any one industry, or in fact, to any group of industries.

Liquidating the "Bank" Centrals.—Before the subsidized centrals had fairly begun operations, the islands' trade balance swung to the negative and there came demand for the legitimate use of the dissipated currency reserves. The peso began a dangerous downward fluctuation. There came months when no exchange could be had, when practically the only sources of negotiable value attaching to Philippine currency were the intrinsic value of subsidiary coinage and the name of the United States of America printed on the face of the notes.

Rehabilitation, theoretically, could have been effected by selling the fixed assets of the Bank's industries including the sugar centrals. There was no use to attempt solution of the political difficulties surrounding such a procedure because there were at the time no purchasers. As an indirect policy had been employed in capitalizing the sugar and other industries, so an indirect method was followed in re-capitalizing the reserve funds. No direct appropriations from revenue were resorted to. Instead, the Philippine islands unhesitatingly, but necessarily increased the national debt by $51,000,000—rising from $16,000,000 in 1916 to $67,000,000 in 1923—an increase of over 400 per cent. This was accomplished by the perilously simple process of selling bonds endorsed by the United States, to citizens of the United States.

It was assumed that at least a part of the increased debt could be offset by selling or bonding the sugar centrals. Sale of centrals would necessarily have to be to the planters, to other local capitalists, or to American capitalists.

The same planters who could not pay the interest and principal of the construction loans on the centrals obviously could not purchase except on a long time amortization, which would defeat the ends of the administration—"to get the government out of business." Very recently (September 1923) an option for the sale of Binalbagan, the largest, and potentially the best, of the "Bank" centrals, valued at $5,500,000, has been granted to a group of local capitalists which includes some of the planters whose lands are contributary to Binalbagan. The figure is for 80 per cent. of the original value: the time is three years; and both the option and the installments, in case of sale, are well secured. The National Bank management is to be congratulated on this excellent stroke of business.

If, by any chance, similar disposition could be effected before the end of 1924 in the case of the remaining five "Bank" centrals, and if firm efficient authority, such as now exists, should continue in the Philippine National Bank, thus obviating any leniency in collection of payments, the losses of sugar subsidization would be largely avoided. However, as time goes by, the interest, straight and compound, on the construction loans piles up and results in an impossible ratio between the book and replacement values of the properties. With the scarcity of local capital, reasonable sale locally of all centrals is scarcely to be expected.

Suggestion of sale to American or foreign capitalists results in a tremendous political opposition. Planters are not willing to consider themselves bankrupt, although that is the status of many of them. It is the old story of paternal loans and government ownership. It illustrates perfectly the thesis that the government in business is usually an exception to all canons of good management and commercial ethics, and that when so employed the government is wont to place itself above the very code to which it holds its private competitors. It is safe to say that if the Philippine sugar central mortgages and planters' land mortgages were held by any private bank or syndicate, foreclosure would have been impressed on centrals and lands in Philippine courts of justice over two years ago.

For a time attention was focused on a general bonding scheme to include all six of the "Bank" centrals. This culminated in but one offering, the so-called Hardon scheme (August 1923) which was rejected by the planters without whose co-operation any holding company would find operation very difficult.

There are three factors in the bonding problem: the government holding frozen credits; the debtors, sugar planters, holding influence; and the investors holding cash. In any attempt to bond, there at once appear three points for settlement: (1) valuation; (2) guaranteed interest; and (3) control.

The debtors and investors agree to bond if government will write off or defer (which perhaps means the same thing) about one-half of the book value of the credits. This reduction is requested due to the fact that construction of centrals was undertaken at peak of supply and material prices, so that buildings and machinery can, it is alleged, be replaced at one-half their book value. No responsible independent appraisal of assets has been made to date and there exists no grounds on which to figure depreciation. The Hardon bonding plan called for a practical depreciation of 50 per cent. Compared with the 80 per cent. sale figure in the case of Binalbagan this seems rather too great. Replacement value is, nevertheless, the only basis of physical inventory acceptable to bondholders. Who shall stand the depreciation? The planters point to the government. The government has a legal right to force the entire depreciation on the planters, a moral right to share it half and half, but possibly, the political necessity of shouldering it entirely.

The second point in issuing bonds, one which seems not to have attracted much attention when it appeared as the most significant clause in the Hardon bonding plan, is that the government should be required to guarantee the interest on the bonds. There is not a great difference between government ownership and government guarantee of interest on bonds. The chief difference between the two is that in the former the government has control while in the latter bondholders obtain dominance. Government management is invariably modified by political viewpoints; control by bondholders is usually efficient, but contrives somehow to disburse income to the holding company and, however prosperous the property may be, to pass on at least a part of the interest payment to the government.

There remains the question of control. Investors, speaking the only known language of secure capitalization, demand control equivalent to investment and naturally refuse to enter on a minority basis unless provided with a voting trust. The debtor planters desire that control rest with themselves or with the government wherein their voices bear a significant import. The planters are thus asking, in effect, bonding without effective security. It is impossible. No bonds will ever be floated on such a basis. The government might be willing to accept a 50 per cent. depreciation, it might be willing to guarantee interest on bonds but there is small chance of planters and bonders agreeing on the point of control unless the former are forced to it by stern measures. If the planters insist on their stand, they merely force the government to give them the property outright, to accept a lengthy amortization, or to foreclose. Of these alternatives: outright gift would constitute an impossible use of government revenue; amortization would keep the government in business indefinitely; while foreclosure and outright sale to highest bidders, not only of the centrals but also of the planters' lands which stand mortgaged to the National Bank, would let the government out and permit the logical development of the sugar industry—but of a sugar industry which would be largely owned by American or foreign capital. The government has generously waited two years and it is only a question of time before foreclosure will result and the planters need make haste it they care to avoid that event through bonding or local sale.

Crop Loans.—The sugar planters have been raising sugar cane and manufacturing sugar for thirty years. The last ten years have been years of decidedly high-priced sellers' markets. Depsite this fact, a large part of the crop is planted and harvested on loans which now amount to about $2,000,000 annually. It would not, surely, be unreasonable to suppose that after so many years, after enjoying a tariff-protected sellers' market for ten years, and after having their mills capitalized on generous terms by their government, the planters might have some apparent wealth, sufficient at least to put in the next year's crop. However, in all too few cases has this been true. There has been a plethora of extravagance and some gambling. Many planters have yet to exhibit the fundamentals of thrift. Of industry they have a-plenty, but the success of an economic enterprise depends on three things: industry, ingenuity, and *thrift*, and of these *thrift* is the greatest.

Plants cannot afford to be looked upon as wayward nursemaids of an infant industry—they must become dependable, thrifty men of affairs if they wish to control so important a factor in Philippine prosperity. To date, the bulk of sugar crop loans has been derived from government funds. There is a fast approaching end to the inverted cornucopia theory of government in the Philippine islands.

The Future Market.—In world commodities there frequently exists a phenomenon which for want of a better term may be called "the double market." This is true of Philippine sugar. There is an *actual and fictitious market* for all Philippine centrifugal sugar in the United States due only to free entrance as against Cuba. Without free entrance and $1.76 cwt. against Cuban sugar there would be no American port receiving Philippine sugar. The *natural and ultimate market of* Philippine sugar is Europe. The conclusion is upheld by a survey of regional production and consumption of the commodity. Such a survey is presented statistically for recent years in Table II.

TABLE II.—*Regional Production and Consumption of Sugar (Cane and Beet) in Short Tons.*

Region	Production 1921-22	Production 1922-23	Consumption 1922	Probable consumption 1923	Probable surplus 1923	Probable shortage 1923	Probable world surplus 1923
Americas ..	9,020,222	8,344,125	7,302,000	7,509,240	834,885		
Asia	5,900,625	6,059,250	4,893,750	4,991,625	1,067,625		
Australasia	409,500	373,500	315,000	321,300	52,200		
Europe ..	4,541,625	5,191,875	6,801,750	6,937,785		1,745,910	
			Totals ..	..	1,954,710	1,745,910	208,800

Table II indicates that Europe alone has a sugar deficiency. Remove the United States advantage accorded Philippine sugar and the United States would supply itself entirely from Cuba and the Caribbean littoral and leave Philippine sugar to Europe—its natural market. The significance of this condition lies in the fact that, for permanency of the local industry, the cost of production must be lowered to meet the competition in European ports with European beet sugar. If our planters continue to devote any proceeds of the free entrance returns to cost of production—if they are satisfied with an annual profit of $10,000,000—they may eventually find themselves without a market whose average price will be higher than their production cost.

The market for Philippine centrifugal sugar must normally pass through two, possibly three, phases. The first phase will cover that period during which a fictitious United States market will be assured through the extension of a preferential tariff schedule to the Philippine islands. Such a phase we are now enjoying and will continue to enjoy until one of two things occur. Should the American consumer come to believe that the duty on Cuban sugar is the cause of the high retail price of the refined product, the Cuban duty will be taken off. The American housewife wishes to buy twenty pounds of refined sugar for a dollar as she did in 1910, and considering her boycott proclivities it is not beyond the bounds of reason for her to approximate that ptice. It does no good to tell her that sugar at ten cents a pound is the world's cheapest edible carbohydrate. Again, should a purely locally owned production reach such proportions as to come into vital competition with the American capitalized Cuban product, there would be a strong movement to abandon free entrance of Philippine sugar. Either of these eventualities would end the present market for Philippine sugar. The chances of abandoning the free entrance favor would be decreased if any considerable amount of American capital were invested in the local industry. In the event of Philippine independence the United States is bound by treaty to allow Cuban sugar a twenty per cent. preference over all foreign sugars including the Philippines.

The second phase of the marketing of Philippine sugar will be contingent upon the cessation of the first phase. It will be signaled by the necessity of discovering, competing in, and holding a European market. Successful tenancy of such a market would depend, as mentioned, on ability to produce and lay down in European ports at a cost equal to or less than the cost of production in Europe of beet sugar. Whether the Philippine producers will be able to accomplish the movement cannot be forecasted. On their present plane of efficiency they could not. Because of post-war conditions in Europe, especially the depreciation of old world currencies, it is not profitable to attempt an analysis of present cost of European beet production.

The more remote third phase in the marketing of Philippine sugar would be dictated by the establishment of an American demand exceeding possible production in the United States, Hawaii, Cuba, the Caribbean littoral, Central America, and Northern South America. In this case, there remaining a regional deficiency in the Americas, Philippine or other Asiatic sugar would be called upon to re-enter the United States at favorable prices.

Thus it must be held in mind that on a basis of present analysis the *natural* market for Philippine and other Asiatic sugar is Europe, not the United States; that the *natural* competitor with Philippine and other Asiatic sugar is European beet sugar, not Cuban cane sugar; and that for permanency of the local industry cost of production must be radically lowered.

Summary.—Philippine sugar has been in the past and is again to-day the first of Philippine exports. It has become in bulk a centrifugal product, planted and harvested by government loans, capitalized by government subsidy, and marketed by virtue of federal protection. An end of subsidy and loans is at hand, an end of federal protection not improbable, and the necessity for clear, farsighted efficiency in production impends.

"American Policy in China Has Not Changed, But—"

IT would appear that the *China Press* and the *China Weekly Review* are edited by the same person from the context of the editorials. Although appearances are often deceitful, there are many other factors in the situation which might lead one to believe that the same master mind is responsible for an identical accusation in both newspapers that Secretary of State Hughes has committed an indiscretion for which in another country he might soon enough find himself without portfolio.

The matter hinges upon a letter at first reported to be published anonymously and now attributed to the secretary of state of the United States. This letter was not sent through the usual diplomatic channels. It was not given to the Chinese minister in Washington nor to the American minister in Peking. It was not addressed officially in any way. According to both newspapers it was written to someone, name not given, who in some way is related to someone on the republican national committee in the United States.

The letter may be perfectly genuine, probably is, but from its character it can but be the private expression of opinion on the part of one American citizen to another and therefore of little value or significance. Not even the secretary of state of the United States can change the American policy in China because such a change would require armed intervention in China as well as a conflict with all or one of the powers signatory to the agreements reached at the Washington conference. It is the maximum of futile logic to believe that the United States would, on its own, send armed forces into China. It is equally unknowing to assume that all of the nations signing the Washington agreements would agree to armed intervention. Besides, armed intervention would require in the United States, an act of congress; in Great Britain, the agreement of the labor party; and in Japan, the consent of those who effected the change of policy to one of friendship for China. Can any sane man believe that such things can come to pass?

What then is the purpose of the Hughes letter? Were it to shame the Chinese government into constructive activity, it might have been given to the Washington correspondents of the universal press to be scattered throughout China and the capitals of all countries interested in China? It might have been sent to various officials and thus given to the world. It might have been sent to the American chamber of commerce in China in reply to their plethora of *communiqués* from this country on the horrible conditions prevailing here, where after all, most of us live quite comfortably. It might have been delivered in an address before some organization interested in China. Why was this one-time anonymous letter sent to some obscure person and finally published in a weekly paper, given recently to condemning everything in China and finally appearing in the editorial columns of a daily newspaper whose editorials are written according to local rumor by the same man who edits the weekly paper.

One sentence in the letter will be particularly gratifying to those Chinese who have maintained for years that all the foreign powers, particularly the United States, has actively intervened in Chinese affairs.

Mr. Hughes is reported to have written:

"We have done what we could to strengthen it (the Chinese government in Peking) and to give it the opportunity for development. But that development must of necessity take place from within."

The Peking government has within recent years never been the government of the whole of China. It has been little more than a political party temporarily in power. At present it is the Chihll party. It is reported that Tsao Kun is dying; should he die, it may be some other party, perhaps some branch of the Chihli party. The Peking government has not only not been able to control the southern and southwestern provinces of China, but it has not been able to control provinces adjacent to itself. Chihli, for instance, would have none of Li Yuan-hung. Wu Pei-fu is at present in conflict with the Tientsin-Paoting faction of the Chihli Party in power. Kiangsu is rummaging all on its own. Yet these are supposed to be loyal provinces. Now, Mr. Hughes must have been cognizant of these facts, for they are too obvious for anyone to overlook except a petty propagandist intent upon helping one side or another. Omitting even the constant defection of such men as Sun Yat-sen and Tang Chi-yao, one has the less constant independence of Chang Tso-ling in Manchuria and Lu Yung-hsiang in Chekiang. And again one has the personal independence in spite of declared provincial loyalty of all the *tuchuns* in every province of the country.

Who then was Mr. Hughes strengthening? Was he strengthening the Anfu Club against the Chihli party, or the Chihli party against the Kuomintang, or the Manchurian warlord against the Loyang warlord? His letter is reported to state that the United States was strengthening the government of China. What government? Where is the government?

This leads to one other consideration. The republic of China is trying to find a way of governing itself. It has got lost. It will probably find a way out of the maze. It has found its way out several times before in its history. But all this takes time, and now more time than before, because the problem is complicated by mistakes made in the early years of the republic and by such implied intervention as Mr. Hughes is reported to have participated in. Does strengthening the Peking government imply that the United States is going to interfere in the internal affairs of a country and to prevent the people of that country from fighting for their liberties against armed tyrants who are grinding them under the heel? In, for instance, permitting the party in power in Peking to utilize the customs surplus to suppress its enemies and in preventing the party in power in any other place from doing the same, are not the legations in Peking interfering in just this way?

These are interesting questions facing Mr. Hughes, who has according to his accusers, lapsed from a brilliant secretary of state into a somewhat dubious letter writer.

* * *

The letter is accepted as an indication that American's traditional friendly policy towards this country will be continued but hints at certain modifications in order to cope with the existing conditions. It is hailed by interventionists as a response to their repeated demands for drastic action.

American policy toward China may be modified, but—it is well to read the letter referred to in connection with the more significant speech delivered by the secretary of state on November 30 before the American academy of political and social science at Philadelphia on the occasion of the observance of the centenary of Monroe doctrine. In this, Secretary Hughes clearly defined the foreign policy of the United States, and emphasized that cooperation, not alliances was the basis of our diplomacy. He summed up the attitude of the United States towards Europe in the following terse sentences:

We are still opposed to alliances.

We refuse to commit ourselves in advance with respect to the employment of the power of the United States in unknown contingencies.

We reserve our judgment to act upon occasions as our sense of duty permits.

We are opposed to discriminations against our nationals.

We ask fair and equal opportunities in mandated territories as they were acquired by the Allies through our aid.

We desire to co-operate according to our historic policy in the peaceful settlement of international disputes which embraces the policy of judicial settlement of such questions as are justifiable. It is our purpose to co-operate in those varied humanitarian efforts which aim to minimize or prevent those evils which can be met adequately only by community of action.

In short, our co-operation as an independent state in the furtherance of the aims of peace and justice has always been and still is a distinctive feature of our policy.

There is plainly no inconsistency between these policies and the Monroe doctrine. Our position as a world power has not affected it. The question is whether that doctrine is still important under changed conditions. The answer must be in the affirmative.

In regard to American relations with the Far East he traced our diplomatic relations with China from 1784 to date in the following words :

" In relation to the Pacific Ocean and the Far East we have developed the policies of (1) the open door, (2) the maintenance of the integrity of China, (3) co-operation with other powers in the declaration of common principles, (4) co-operation with other powers by conference and consultation in the interests of peace, (5) limitation of naval armament, and (6) the limitation of fortifications and naval bases.

" The *Empress of China,* fitted out by Robert Morris and others, sailed to Canton in 1784, and by the year 1805 thirty-seven American vessels cleared for that port. In 1843 Daniel Webster, secretary of state, instructing Cable Cushing as envoy extraordinary and minister plenipotentiary to China, said : 'You will signify, in decided terms and a positive manner, that the government of the United States would find it impossible to remain on terms of friendship and regard with the emperor if greater privileges or commercial facilities should be allowed to the subjects of any other government than should be granted to citizens of the United States.'

" Most favored nation treatment was secured in the treaty of 1844, with respect to which Cable Cushing said : 'Thus, whatever progress either government makes in opening this vast empire to the influence of foreign commerce is for the common good of each other and of all Christendom.' Thus was laid the foundation for the policy of the open door, or equality of opportunity. When the great powers took advantage of the weakness of China to obtain spheres of interest in order to facilitate exploitation and restrict free commercial intercourse this government, through Secretary Hay, sought to establish by international accord the principle of the open door and with this to obtain the recognition and preservation of the territorial and administrative integrity of China. Despite many obstacles, caused by the disregard of professions and the desire to take advantage of the opportunities afforded by the progressive disintegration of China, this government continued earnestly to press these principles and at the recent Washington conference the postulates of American policy were taken out of the unsatisfactory form of diplomatic notes and, with a more adequate and explicit statement, were incorporated into a solemn international engagement signed by the nine powers especially interested in the Far East. This treaty has been ratified by all but one of these powers, and it is hoped that ratification by that power will not be long deferred.

" While the diplomatic exchanges between the powers, in which the open door policy was fully accepted, were not, of course, satisfactory and later became largely ineffective, they were so strongly supported by public opinion in this country as to make it clear that while we eschewed alliances we were ready to join in declarations of common principles where his method of co-operation would supply the best means of attaining the desired object. This was again illustrated by the resolutions adopted at the Washington conference.

" Again through the four power treaty between the United States, Great Britain, France and Japan, which is to continue for ten years and thereafter be subject to termination on twelve months' notice, we have established another form of co-operation with regard to insular possessions and insular dominions in the region of the Pacific Ocean.

" It is provided that if any controversy arises between any of the parties out of any Pacific question which cannot be settled by diplomacy, with regard to their rights in relation to these possessions and dominions, they shall invite the other parties to the treaty to a joint conference to which the whole subject will be referred for consideration and adjustment. Also, if the rights sought to be safeguarded by the treaty are threatened by the aggressive action of any other power, the parties shall communicate with one another fully and frankly in order to arrive at an understanding as to the most efficient measures to be taken, jointly or separately, to meet the exigencies of the particular situation."

The key-note of the speech, as indicated above, was co-operation with other powers and it is safe to say that this principle will influence the administration's attitude toward any development that may arise in China. Under certain conditions America may co-operate with other powers in which all concerned will share equally the responsibility; she may, under certain conditions, use her naval forces stationed in China to protect American lines and properties. China will be held to strict accountability for losses to American lives and properties and interference with legitimate trade rights, and, when the time arrives, the bill will be presented and China will pay.

It is hardly probable that the American people will approve of independent intervention in China, when they would take no steps to clean up their own back door, nor is it probable that the present administration will so far depart from the principles laid down at the Washington conference as will provide political opponents with arguments to defeat it during the coming political campaign.

The letter ascribed to Secretary Hughes may forshadow some significant change in American policy toward China, but whatever that change may be, it will in no wise violate American traditions or lead to any independent adventure to place China on her feet.

French Enterprise in the Orient

Like many foreign firms which have opened works in France, certain French firms are pursuing the policy of setting up factories abroad.

One of the latest arrangements of this kind has been made by a number of glass manufacturers. The Société des Verreries d'Extrême Orient is an association representing the Société de St. Gobain, the Société des Glaces Nationales Belges, the Société Financière et Coloniale, the Distilleries Indo-Chinoises, and the Société de Chimie d'Extrême Orient. This organization contemplates doubling its capital of 5,000,000f., and as a means of keeping a hold on the Far Eastern market, will supply buyers there with goods from the factories it controls at Haiphong, Tonkin. There will thus be a great saving in the cost of transport.

* * *

American-Japanese Co-operation

The Mitsubishi-Westinghouse Combination

THE success attending American co-operation with Japan in the combination of the General Electric with the Mitsui interests (known as the Shibaura Engineering Works) in the Tokyo Electric Company, and the Western Electric participation in the Nippon Electric Company has paved the way for another equally important combine in which the Westinghouse Company becomes associated with the great Mitsubishi interests in the manufacture of electrical machinery.

" The new company is known as the Mitsubishi Denki Kabushiki Kaisha, or in English, the Mitsubishi Electric Manufacturing Company, and starts with a capital of Y. 16,000,000.

" The reasons for the formation of this company, as given out in New York by Mr. E. D. Kilburn, vice-president of the Westinghouse Electric International Company, are as follows: The Westinghouse Company has for many years been engaged in promoting the use of electricity in Japan, and its efforts have met with so favorable a reception that Japanese electrical development—including railroad electrification, the use of waterpower, the installation of large steam generating plants and the formation of superpower systems—compares favorably with that in the United States.

" As a consequence of this rapid development, electrical apparatus has become one of Japan's largest imports, and since Japan's principal exports, silk, copper, and objects of art cannot be expanded by a corresponding degree the Japanese began to feel that there was danger of a continuing unfavorable balance of trade. Hence it seemed wise to Japanese interests to begin the manufacture of electrical machinery and supplies in their own country.

" In persuance of this policy, the important Mitsubishi interests, which are engaged in banking, ship building and steel making, approached the Westinghouse Electric Company with a proposal for a co-operative agreement whereby the Westinghouse company was to supply technical skill and experience to a Japanese manufacturing company.

" The Mitsubishi Electric Manufacturing Company is the outcome of these negotiations. The Japanese profit by the arrangement through the employment it will give to Japanese workmen and the improvement in their foreign trade situation, while the Westinghouse company profits by receiving a continuous revenue for services and royalties in lieu of exports, that it was certain to lose within a comparatively few years. The United States profits because if the Westinghouse Company had not accepted this proposal, it is possible that a German firm would have been considered by the Mitsubishi organization.

" The Westinghouse company has subscribed for a portion of the stock of the Japanese company.

" A third party to this agreement is Takata & Co., the well-known Japanese importers, with offices in 30 Church-street, New York city. This concern, which is the Japanese agent of the Westinghouse company, will play a large part as distributer for the Mitsubishi Electric Manufacturing Company and will also continue to import such Westinghouse products as will be supplied from America."

Anti-Japanese Propaganda

Libelling the Japanese Group

"N*O loans have been made to or in China by the new consortium, but it is a fact that Japan has made heavy loans both for administrative and industrial purposes since the agreement was signed.*" This categoric statement is made at the outset of a series of articles which appeared during November in the *Wall Street Journal*, a financial newspaper regarded as an authority by American bankers.

M. Padoux, financial adviser to the Peking government, is quoted as saying "during the progress of the war, Japan was the only member of the consortium who was in a position to supply China with money. It was thus that the Japanese group made the first, second and third advances, though in the name of the consortium as a whole on the second reorganization loan of 10,000,000 yen each in September 1917, January 1918 and July 1918. Besides the official member in the consortium, the Japanese were very active in 1918 making loans to China, some through a group composed of the Industrial Bank of Japan, Bank of Chosen and Bank of Taiwan and some through the Exchange Bank of China. The figure ran up about Y.150,000,000. This aggressive loaning policy stirred up opposition of the Chinese people and attracted attention of the other powers."

It is true that the Yokohama Specie Bank, the only member of the Japanese group in the old consortium, advanced Y.30,000,000 in three installments to the Chinese government secured on the salt revenues in the name of the consortium as a whole. There certainly could have been no criticism on the part of Great Britain or France to such a transaction, which protected their interests and returned the accommodation which the British group extended to Japan in 1913 when the original reorganization loan was issued, in which the British guaranteed the Japanese share and the French group the Russian participation. Throughout the progress of the war the official Japanese group worked in complete harmony with and lived fully up to its obligations with its partners. It had no participation in any of the so-called independent or Nishihara loans, in fact, the Yokohama Specie Bank opposed these transactions. In commenting on Japanese financial activities in China during the war, the fact is overlooked that American bankers had equal opportunities to furnish the Chinese with money in the Lee, Higginson, Commercial and Continental Bank and the Pacific Development loans, which aggregated some sixty million gold dollars, although only the first installments amounting to $11,000,000 were placed on the market. Every opportunity offered by China to Japan was fully equalled if not surpassed by inducements held out to Americans. The combined Japanese transactions fade into insignificance before the 1,500-mile Siems Carey railway contract with the possibility of its being extended another 1,500 miles. At the lowest possible estimate this contract called for loans aggregating $150,000,000 gold, with the privilege of constructing a further 1,500 miles of line at the same estimate. This does not include the estimated cost of the grand canal improvement contract—another $30,000,000 gold. Had the various contracts signed by the Chinese with Americans during the war been carried out, the amount involved would have approximated $400,000,000 gold or four times the total of the Japanese transactions. The Americans, for one reason or another, could not or would not raise the money, while the Japanese carried out their obligations. Had Americans done likewise, probably other nations would have combined to undermine their position in the same manner as they came together to injure Japan.

Historians of the consortium overlook these facts in order to perpetuate a fiction seized upon to justify its creation. For a responsible financial newspaper to publish at this time the utterly mendacious statement that Japan has made heavy loans to China for administrative and industrial purposes since the new consortium agreement was signed, indicates how easy it is for American publishers to be misled by Chinese correspondents whose only stock in trade is an outworn anti-Japanese propaganda. Japan has *not* made heavy administrative or industrial loans to China since the formation of the new consortium. The utmost harmony and complete understanding exists between the groups, especially between the American and Japanese bankers, a fact which the *Wall Street Journal* might have ascertained by stepping across the street and interviewing Mr. Lamont.

A certain amount of legitimate Japanese capital has come into China for industrial development since the formation of the new consortium. So has a certain amount of American capital. The writer of the articles in the *Wall Street Journal* invites attention to the fact that " Arthur L. Burton, chief engineer of the Pao-Cheng Cotton Mills of Shanghai, who returned from a trip to the United States recently, made the statement that one industrial enterprise which calls for an investment of about $15,000,000 gold is now being promoted and that most of this money has already been subscribed in Boston." When the capitalization of the enterprises floated by the late Chow Tse-chi on his last visit to America are added to the above, together with other legitimate American ventures, the total will probably far exceed the amount of Japanese capital invested in China for similar legitimate porposes. To state that Japan is making administrative and industrial loans to China since the signing of the new consortium agreement is an unwarranted slur on the good faith of the Japanese group which has made no independent move since the signature of its representative was affixed to the new compact.

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THIS phase of American indifference towards investments in China is touched upon in the letter alleged to have been written by Secretary Hughes to a member of the republican national committee who has a brother engaged in missionary work in this country. The copy sent to the latter and immediately released for publication in a Shanghai weekly clearly indicates that some " Reverend " had made charges to the effect that Japan was trying to " annex some 200 miles of coast north of Shanghai," providing evidence that the story was placed before Secretary Hughes in order to influence his attitude towards Japan.

The answer of the writer to this should provide food for much thought by those who still believe that everything Japan does in China cloaks some sinister purpose. He says :

> " I acknowledge myself somewhat puzzled by certain of the statements made by the Reverend——in the letter which your brother encloses to you. He says that Japan is trying to get 200 miles of coast just north of Shanghai. I would give no credence to any report that Japan is seeking to annex this territory; and I assume that the Reverend——refers to the fact that Japanese capitalists are seeking to obtain contracts for certain industrial and agricultural developments in the region indicated by him. There is, so far as I am aware, nothing illegitimate, and nothing extraordinary, in the Japanese projects referred to : so far as my information goes, these plans for conservancy and agricultural works are not fundamentally different from those for which the opportunity has for several years been open to American interests. Having in view the ultimate possibilities of China as a capital market for American manufactures, it is perhaps unfortunate that American capital and industry do not, under present circumstances feel safe in venturing to avail themselves of the opportunities for development in China, but safer to invest in enterprises in Japan, to a large extent leaving the Chinese field to be developed by other nationalities—principally by the Japanese, whose isolated position leads them to develop their economic interests in China for the future. That, however, is a matter of economic conditions, which is not within the effective control of any agency of government. We cannot compel our capital or our enterprise to seek an outlet in China, nor could we prevent their making profitable investments in Japan. Nor, regarding the matter from another viewpoint, would we be able to bar Japanese capital from availing itself in China of the opportunities which are there open. The sole policy for this Government to pursue is to insist that these opportunities be open to all alike, so that Americans may have their fair chance of availing themselves of them if they will."

This is to the point. Present conditions in China are having the effect of influencing American capital to invest in enterprises in Japan, and between the lines, in enterprises in China controlled by Japanese. The American government cannot prevent its nationals from making profitable investments in Japan nor can it bar Japanese capital from availing itself of opportunities in China, nor can it intervene to prevent Americans from participating in these investments. Americans would much rather co-operate financially with the Chinese for the development of industries in their own country, but until such time as China can provide more adequate guarantees for safeguarding these investments, they will seek opportunities elsewhere.

Sun and the Customs

Hitting the Under Dog

THE foreign press of China has a habit of filling editorial columns with attacks on Sun Yat-sen. The idea is that every time anything goes wrong Sun is responsible. When there is banditry in Honan, the headquarters of Wu Pei-fu, outlawry on the upper Yangtze, the political balliwick of the Chihli faction, or illegal taxation in Chekiang, the headquarters of the Anfu Club or in Kiangsu, a province loyal to Peking, it is a subject for diplomatic discussion. But when Sun Yat-sen displeases the foreigner, all hands rush on board to destroy him.

Sun Yat-sen said that he would seize the Canton customs house and immediately the powers sent gunboats and admirals and all sorts of officials to intervene and if necessary to fire upon the city. When Lu Yung-hsiang in Chekiang interferes with foreign trade by imposing illegal taxes, by seizing foreign goods in foreign-owned warehouses, by forbidding foreign-owned houseboats to ply the rivers of his province, no gunboats are sent, no demonstration is made, no admirals appear on the scene. When Anhwei refuses to recognize the transit pass or Honan permits the kidnapping of missionaries right under the very nose of the greatest of Peking satraps, it is a subject for the soft pedal.

Into the rights of Dr. Sun's contentions it is difficult to go. He claims that it is absurd to permit money to go out of Kwantung into the treasury of those who would utilize it to purchase arms for the subjugation of Kwangtung and the massacring of its people. On the other hand, foreigners must insist that the customs service shall remain intact in accordance with the treaties between China and the foreign powers. Even so superficial a statement of the case brings out the fact that there is much right in principle on both sides. In the method of handling the question, Sun, however, has the advantage over the legations in Peking, in that he has solidly behind him the support of the people of his own province who would regard the question as one of internal politics between the government at Canton and the government at Peking. They cannot see wherein lies the right of foreigners to interfere. If Sun Yat-sen were weak before the customs episode, he was all-powerful immediately thereafter.

It is rather curious to see what shiftings there have been in opinion with regard to China. Those who for years were active propagandists in the cause of China for the Chinese, the damnation of foreign rights in China, the condemnation of Japan and Great Britain for aggression in China, are now the most bitterly insistent upon foreign intervention in some form, with the United States as the chief interventionist. Why these Americans want to throw the full onus of disorders in China and foreigners' mistakes in China upon their own country, is difficult for an American to understand. When they were so pro-Chinese that they outdid the Chinese themselves in Celestiality, they had axes to grind. They wanted special favors from the Chinese to the disadvantage of all other foreigners in China. It is to be presumed that now that they take the other view, they have either not received the favors or they have changed their tactics from cringing mendacity to loud-mouthed blackmail.

In taking such an attitude toward Dr. Sun Yat-sen these men have hit upon the wrong citizen. Sun is afraid of no one. That is perhaps the secret of his enormous success with the Chinese people. He knows exactly what he wants. He knows that it is impossible to achieve his aims as rapidly as even his own most ardent supporters imagine. He knows that to make so large and unwieldy a country as China an effective republic, a modern state, will take a generation, perhaps a century. He appraises the forces of his antagonists both within and outside the country and he realizes that they are legion. But he faces them with the bravery of the certainty of an idealist. He stands before the world the rare exception in Chinese politics, a clean and honest man. When the journalists who edit foreign-language newspapers in China, attack such a man they place themselves in the position of supporting all the filth and corruption in Chinese affairs Sun opposes.

* * *

Intervention?

"IN the event that Dr. Schurman fails in his unofficial mission to induce the Peking authorities to voluntarily allocate Canton's share of the customs surplus for public improvements in this province, what will you do," I asked Dr. Sun two days after his interview with the American minister.

"I will take over the customs," he very quietly but firmly replied. "I may not hold them for more than an hour: I may hold them only five minutes, may be only a second, but I will hold them for that second and force the powers to intervene in the affairs of China on the side of Peking and compel public opinion throughout the world to take heed of the situation."

Dr. Sun Yat-sen will keep his word. If the powers keep theirs, it means intervention on behalf of Peking under cover of protecting the customs. In creates an entirely new precedent in international law and says in effect that any people struggling against a despotic and tyrannical government whose customs revenues are pledged for foreign loans may not hope to strike their enemy in his most vulnerable spot. Dr. Sun further said: "I recognize the moral obligation of Canton to meet its full share of the national debt and am willing to provide all necessary guarantees that the quota collected in the provinces under my control be set aside for the service of the foreign loans secured on the customs. The amount involved in the dispute is comparatively small. I can get along without the surplus if needs be, but I am determined to establish the justice of the principle involved."

"The powers do not recognize me" he continued. "They do recognize Peking. I am at war with Peking. I do not recognize its authority in Canton. We have maintained our independence for several years. Peking is powerless to impose its authority in Canton. The powers, through control of the customs, have paid over to Peking the surplus which has been employed to fit out military expeditions against Canton, forcing us into desperate straits to raise funds to defend ourselves against our enemy. Our people have been mercilessly slain; their lands have been overrun with soldiery; their properties have been destroyed; their women ravished and their homes violated; thousands of lives have been sacrificed in the mad attempt of Peking to place the yoke of submission on our necks. Trade is at a standstill. The Canton-Kowloon railway is taken over for military purposes and foreigners complain because the installments on their loans are not paid. We have been forced to extreme measures to raise funds within the province to carry on our fight for constitutional government. We have been criticized and condemned for the methods we have been forced to employ in raising revenues all because the northern militarists receiving the recognition and support of the powers continue to fit out expeditions for the purpose of invading our province. We will not submit to Peking. We will prolong the war and seize everything that belongs to our enemy. The powers have no right to intervene in this purely Chinese domestic fight. If they have any objection to my taking over control of the customs, let them complain to the recognized government at Peking. When they step between me and Peking and deny my right as beligerant to injure my enemy, it is intervention in the affairs of China. When America entered the war against Germany, her first step was to seize all German vessels in American ports and confiscate other enemy properties. I am doing exactly the same thing with the property of Peking located in my territory. Nobody has a right to interfere, especially when I recognize the validity of the powers' claim to the customs revenues for the service of loans contracted by China as a whole, and when, furthermore, I am willing to provide guarantees that Canton's share will be paid into the proper depositories for the service of the loan, I am even willing to go further, and guarantee that if the Canton customs revenues falls short of its quota for the service of these loans, I will make up the deficit from other revenues."

"Minister Schurman recognized the justice of my position, and in the discussion as to how actual intervention could be avoided, he offered to propose to Peking through *unofficial channels* that my claim to a proportionate share of the customs surplus be voluntarily allowed and that the funds be employed for public improvements. I am perfectly satisfied with such a solution, as it necessarily works both ways and the surplus handed over to Peking must also be employed for constructive work. All this is for the benefit of the Chinese people and will aid foreign trade. I gladly assented to any plan which would deprive the militarists of the enjoyment of these revenues and make for the development of the country. The recognition of the principle is all that I am contending for.

"As to the statement that there is no customs surplus, that it has all been employed for the service of internal loans floated by Peking, we maintain that all these loans were dishonest and the proceeds either went into the pockets of Peking officials or were employed in fitting out military expeditions to crush the south. The foreign powers are not concerned with the disposal of the customs after their just claims have been met. They have no jurisdiction or right to intervene for the protection of Chinese bondholders and the south cannot recognize the right of the north to issue loans secured on the customs surplus and employed for fighting the south with. It is only necessary to recall that the inspector-general of customs was compelled two years ago to publicly advertise that certain internal loan bonds were illegally issued, to support the statement that the customs surplus has been raided by Peking for its own purposes. In addition to the internal loans secured on the customs surplus, there are reported to be several millions of dollars or internal loan bonds scattered throughout China and secured on the customs surplus that have been issued illegally by the Peking financial authorities. We cannot recognize these bonds, and the frank attitude of the inspector-general of customs in also repudiating such transactions is proof sufficient that he is dealing with a dishonest government. Coming back to the present situation, we are justified in asking for such percentage of the customs surplus which pertains to Canton after the foreign obligations have been met. We are willing that it be used for the benefit of the public, but unless this is conceded and the rule works both ways, we will see that we collect our share of the revenues at Canton."

This, in effect, describes the situation at Canton, and while recognizing the foreign point of view, it is well not to entirely ignore the Chinese viewpoint. Up to the present, Dr. Sun Yat-sen has scored a victory over the powers. For the first time in years he has compelled the attention of the world. He has puzzled the foreign offices, worried the legations and had the admirals guessing. In 1898, Germany sent two small gunboats into Kiaochao harbor and laid certain demands before the Chinese government. Peking hurried to comply, handing over its most valuable northern port with preferential rights to a whole province. The powers sent 21 gunboats to Canton to coerce and intimidate Dr. Sun Yat-sen. He is still there, and says he will carry out his plans. No matter how foolish he may be according to the foreign way of thinking, Dr. Sun is a great man with the Chinese. He has done something which no other Chinese has dared to do. He has flouted the foreigner and compelled a naval demonstration which overshadows any previous similar incident in Chinese history. His prestige with the Chinese to-day is greater than ever, and if the powers land troops to protect the customs, all China will rally behind him.

The powers are worried. Interference with Dr. Sun spells intervention and the powers know it. The can have no valid excuse after Sun guarantees to protect their interests in the customs receipts. Dr. Sun made a special appeal to Americans for support, but the state department answers that solidarity amongst the powers is essential for the preservation of the customs and will not depart from its present policy. Dr. Sun and his friends point out that America has no special interest in the customs revenues, except for the service of the Boxer indemnity which she long ago remitted in part and is now talking about remitting the remainder. Great Britain, Japan, France, Italy and others are interested in preserving the customs as security for certain loans and the Boxer indemnity, and there is some excuse for their opposition to Dr. Sun's plan. America, continues the intimates of Sun, has made no independent move to protect its loans defaulted by Peking, but joins in on a basis of equality with others for the preservation of their particular interests. International co-operation along these lines in the coercion of China will, in the opinion of Dr. Sun's immediate followers place America in a most embarrassing position with those Chinese who have hitherto relied upon her disinterestedness.

Can America afford to be placed in a position of defeating a people who are struggling for constitutional government under the plea that solidarity of the powers in support of Peking is more important than the triumph of an ideal? This, at least, is the way Dr. Sun and his associates sum up their argument against America's participation in any further attempt to coerce Canton in favor of Peking.

Sun is determined to force the issue. He will not give way, so he says. He has only temporized because Dr. Schurman offered to use his unofficial position to bring about an equitable solution. If he fails, and Sun proceeds to take over the customs, and the powers adhere to their present position, China will be face to face with intervention. It is to be hoped that Dr. Schurman does not fail.

G. B. R.

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Radio Corporation Enters China Field

The Federal Telegraph Company of California has transferred all of its rights and titles in the $13,000,000 contract for construction and operation of radio stations in China to the newly organized Federal Telegraph Company of Delaware, a $9,500,000 corporation.

The sole stockholders of the Delaware corporation are the Radio Corporation of America and the Federal Telegraph Company of California, it was said.

The China-Federal Radio Company, with $13,000,000 capital, was owned jointly by the Federal Telegraph Company of California and the Chinese government.

* * *

I.B.C. Acquires the Asia Bank

SLOWLY, despite efforts to pull themselves up by the boot-straps, Americans in China are slowly losing the favorable position gained during the war. To the long list of firms who have gone under or pulled up stakes and departed is now added the Asia Banking Corporation, which is to be amalgamated with the pioneer and premier American financial institution in the Orient, the International Banking Corporation.

Details of the transaction are not yet available in Shanghai, but the Asia Banking Corporation officials have issued the following statement with regard to the transfer:—

> "The Asia Banking Corporation has entered into an agreement for the sale of its assets and business to the International Banking Corporation, subject to approval of its stockholders, and a special meeting of such stockholders has been called to act upon such sale. A subsequent announcement will be made as to the date when its business will be transferred to the International Banking Corporation. It is felt that this action will be helpful to American banking interests in the Far East."

The Asia Banking Corporation opened their Far Eastern head offices in Shanghai on February 7, 1919. Since when it has been one of the most popular institutions of its sort to be established in the Far East in recent years. It began its career by instituting American banking methods of the latest style and acquired a large clientele.

The Changing Chinese

By George E. Sokolsky

"THE Chinese have changed." This is a phrase which goes the rounds of clubs, directors' meetings, missionary conferences, newspaper offices and other institutions of comment in China.

The Chinese have changed in their attitude toward foreigners. Nothing could be more natural. They have come to know the foreigners better; they have come to regard them as human beings, rather than as gods utilizing consuls, legations, gunboats, arms and munitions to wreak their vengeance. They have come to like the foreigner better, on the whole, although the adulation for each individual is perhaps less.

In the old days, the average foreigner knew his boy, his cook, his compradore and his shroff. The foreigner who knew a few "pidgin-English" speaking Chinese merchants was a well-informed man. The scholar who knew somewhat of the language and the customs of the place was an exception and generally an eccentric D.D.

Nowadays, the average foreign merchant in a city knows all the important Chinese of the place. He knows the merchants, the officials, the professional men and many of their wives. He dines at their houses and invites them to his. It is true that the clubs are still closed to natives, but in a city like Shanghai, the Union Club and the American University Club are jointly American, British and Chinese, and all get along well together. A large number of foreigners know some dialect of the Chinese language and every foreign chamber of commerce either conducts language classes or encourages novices to study the language.

Sons of Chinese officials and merchants visit foreign countries and get to have an insight into the customs of the place. Recently Mr. Cheang Koon-chi, the son of Mr. Cheang Park-chew, the most important Chinese in the tobacco business, visited every important tobacco country in the world. No foreigner can put anything over on him with regard to tobacco, simply because he is a foreigner. Mr. Chang Chien, Jr., son of China's largest cotton magnate, is doing the same thing with regard to cotton at this moment. Every year thousands of Chinese study at American, British, German and French universities and a few thousand more travel as tourists.

The first thing that the Chinese learn is that the really big men of the country stay at home. That is, that the sabre-rattling, desk-banging, noisy colossus in Shanghai or Peking is a very small fry in Washington, London or Paris. The Chinese try to get to know the big men at home. They find out what America, Britain and France really think about China, and they get their knowledge first hand. When the legations at Peking make a noise, the Chinese send out an S.O.S. to find out what the press of the various countries have to say, what Wall and Lombard Streets think, how the chancellories are reacting. When the American chamber of commerce of Shanghai passed a powerful, strong arm, big-stick resolution, the Chinese knew beforehand that Washington would have none of it. They are changing because they know our ways.

One of the first things to affect Chinese ideas of foreigners was the war. All foreigners used to look alike to the Chinese. Then the war came and the Allies and the Germans got calling each other names and the Chinese believed them both. The Chinese attitude was that when thieves fall out the truth comes out. They took it for granted that the Germans knew the Allies better than the Chinese did, and that the Allies knew the Germans better than the Chinese did. They bowed to superior knowledge. Then came the Russian revolution and the Chinese heard all about the Russians. They were told not so much that the Russians were red but that they were scallawags and they hoped it was true. But they also heard what the Russians had to say about the rest of the world. This cussing all over the place did the foreigners no good in China. It simply confirmed the opinion of the Chinese that all the foreigners were indifferently bad.

Before the war, the Chinese had an ungodly fear and respect for German militarism. Here was a machine that would meet all comers and hand out knock-outs with the rapidity of a "Big Bertha." But the machine caved in and when the war was over, the Allies forced China to deport all Germans. The Chinese deported the Germans, seized their property, grabbed back concessions, abolished extraterritoriality and eventually got back Shantung. When it was all over, the foreigners just began to realize that they had taught the Chinese to get back their own and that there was no telling where the getting would stop. In a word, the foreigners had set in motion all the forces for an abolition of the extra privileges which the foreigners enjoy and want to hold.

They did the same to the Russians. But that is a much more serious problem because in Harbin alone there are perhaps 75,000 of them. When an Italian was once arrested in Harbin and treated roughly by the Chinese police, the latter apologized to the Italian consul explaining that they thought he was a Russian. Russians anywhere in China are having a very hard time, and the Chinese themselves wonder why they don't go home. In the old days, all foreigners were rich, except beach-combers and they were taken care of by their consuls. Nowadays, thousands of Russian refugees are starving in China, eating the bread of Chinese charity, and, in many instances, competing with Chinese coolies for jobs. The Chinese face facts and believe that the mighty white race has fallen. They are taking advantage of the situation as advantage was taken of them.

In the old days, any breach of peace was followed by at least a naval exhibition of power. Usually an indemnity was demanded and China had to pay. When she had no money, which was usual, she was told where to borrow and under what conditions. Soon, however, foreign trade got to be more important than vested interests. The foreigners were more careful to offend Chinese public opinion because it might hurt their trade interests. The Chinese quickly took advantage of the situation and utilized the boycott to enforce their will upon foreigners. They succeeded with the Japanese and taught all foreigners discretion.

China has a large number of treaties with foreign nations. These treaties are all unfavorable to China, that is, they give to foreigners rights which the Chinese do not enjoy in foreign countries and which are unusual, such as extraterritorality, lack of tariff autonomy, concessions, etc. These treaties China has to abide by, but the question often arises as to interpretation. Often there is a discrepancy between the English or French version and the Chinese version. Since the American Returned Students have come into power in the ministry of foreign affairs, there has been a tendency to interpret treaties more strictly, whenever a strict interpretation helps China, and to admit that the Peking government cannot enforce its will on the provinces whenever the provinces ignore the treaties.

An example of the latter is the Cigarette Tax Chekiang province levied; a 20 per cent. tax on cigarettes in addition to taxes already paid to the Central government, which is a contravention of the treaty. When the Legations protested they learned that Chekiang was temporarily independent of Peking and that the tax would be abolished as soon as Peking got control—an inference that the legations ought to help Peking out with a fat loan. Meanwhile, other provinces saw that Chekiang was making some extra money and they tried the same dodge. Most of the provinces faithful to the Peking government, including those under Tsao Kun* and Wu Pei-fu, who dominate Peking, have instituted a cigarette tax. But Peking still replies to protests suavely; Peking still talks about the independence of Chekiang. Wellington Koo is the master of this sort of diplomacy: that is the only reason for his importance to Peking.

During the war, China sent a coolie corps to France and Russia. These countries do not suffer much from color prejudice. The coolies returned, telling wondrous tales of good times in both countries. Their pornographic yarns have not heightened China's regard for foreigners. The Chinese had always thought that those things were not done. Later, every treaty port had its quota of Russian prostitutes and in Manchuria, many Russian women became the concubines of Chinese officials and merchants. In Shanghai dance halls, some Chinese young blades amused themselves with Russian women and bought them champagne. Stories of their goings-on went the rounds in Chinese circles and seriously lowered their regard for foreigners. Most of the coolies returned from France came from the interior places in Shantung and the Chinese there, who see few foreigners, heard stories, true and untrue, which did the foreigner in China little good.

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*Tsao Kun has become president of China.

The anti-Japanese boycott in 1919 was a nationalist movement. Lead by the student element, it was designed to indicate China's ability to prevent further foreign aggression by an economic weapon. Foreigners, particularly British and Americans, sympathized with the aims of the students and assisted them whenever possible. Every American organization in China passed resolutions against the Versailles treaty with regard to its Shantung provisions. The Chinese won. The effect of their victory was to indicate the effectiveness of this weapon and to encourage its use against all who opposed the will of China.

Furthermore, the ruling classes and militarists came to regard this weapon as an instrument for diverting attention from internal politics to international relations. The anti-Japanese boycott of 1923 was just such a tool. The Chihli faction, desiring to elect Tsao Kun, President of China, and realizing that the people of China on the whole were opposed to him, started the boycott movement on the dead issue of the Japanese hold on the Liaotung peninsula in South Manchuria. The boycott was effective in Chihli province and the upper Yangtze Valley where the Chihli party is in power. In Shanghai and South China it was hardly known. This is a dangerous business, because it is not always Japan that is unpopular. Recently the British and Americans were bordering on unpopularity because of the Lincheng note and the demand for foreign supervision of the railway police. When the Chinese were boycotting the Japanese, it was a joke. It might not always be such a joke.

In all of these questions the innate conservatism of the Chinese is naturally a factor. But Chinese conservatism is not a matter of the elders trying to keep the young within a traditional range of vision. It is rather a racial desire to maintain itself. Chinese conservatism, for instance, is not anti-foreign. Until the Spanish and Portuguese came to this country with their utter disregard for the home traditions of the Chinese people and an assertion of superiority which never fit the facts, the Chinese welcomed foreigners, gave them jobs in the government, and, it is safe to say, although the facts are not easily verifiable, permitted them to marry Chinese wives.

At Ningpo, the first western European foreigners to come to China, outraged every law of decency and frightened the Chinese into the belief that Europeans were all pigs and barbarians. Their conduct toward women, in particular, produced a most unfavorable impression upon the Chinese. It should be noted that at Lincheng and Paotzeku, the bandits never molested a woman physically; that in spite of the insufficiency of wearing apparel and the utter helplessness of the women, there was no rape, no indecency, no emphasis on sex, such as usually accompanies, for instance, a western army of invasion. When this characteristic of the Chinese is understood, the attitude of the Chinese toward the first settlers is easily understood. For these Spaniards and Portuguese and Dutch carried off Chinese women to their ships and kept them there; they misbehaved in a manner despicable even to a Chinese bandit.

Naturally the Chinese shut their doors to foreigners. They could not be expected to differentiate between one Frank and another. They were all westerners and many red-headed ones. This attitude the foreigners have learned to term the conservatism of the Chinese. Actually, it is a racial experience, a racial fear of what might happen from too close personal contact. But the Chinese have not put up a fight against the education of women such as the West experienced. They have not opposed schools for women as they were opposed in many western countries. They have not opposed the modern factory system, the industrialization of production, as it was opposed in western countries upon the introduction of the steam engine. Only in the upper reaches of the Yangtze where the steam-boat is replacing the Chinese junk is there a conflict over a modern machine. In the cotton industry, the silk filature, the iron and steel industry, mining, flour milling, rice milling, even agriculture, is progress among the Chinese more rapid than it was in western Europe. That is, the Chinese have only come to know modern methods within two or three decades and they are accepting new methods already, while in the West, it took centuries of argument and agitation to convince the conservative-minded that the world moves.

Instead of being conservative, the Chinese are actually a most adaptable people. They lack national efficiency it is true, and therefore their roads are poor, but the Good Roads Movement for China commenced its career in 1921 and already there are good roads in every province. Some day the Chinese will learn that the mere building of a road is not sufficient, that a road must be well-maintained; that the mere erection of a cotton mill is not good business, that it has to be well-financed and administered; that the mere desire to modernize is not progress, that modernization must be on a basis beneficial to the country. But the failures of the Chinese are not an indication of conservatism. Rather are they indications of the inability of the Chinese to imitate; of the necessity for Chinese to study and assimilate rather than to study and to copy like the Japanese.

In the changing attitude of the Chinese toward the foreigners this so-called, misunderstood conservatism is a great factor. The Chinese themselves are learning rapidly that they cannot mimic the West, that they have to produce something of their own. This leads to a movement away from foreign things. For instance, in the matter of dress: immediately after the revolution, eleven years ago, all the young men took to foreign clothes and some adopted foreign surnames. The clothes proved, to many of them, ungainly and uncomfortable because the lack of physical exercise makes the Chinese body less sightly than that of a western football star and the cut of foreign clothes brings out the round shoulders and the pigeon chested breasts, while Chinese clothes serves to hide all defects. Also the heating arrangements in Chinese houses, ventilation, decorations, etc., make a Chinese both uncomfortable and incongruous in a Norfolk suit and a tweed hat. He looks foolish.

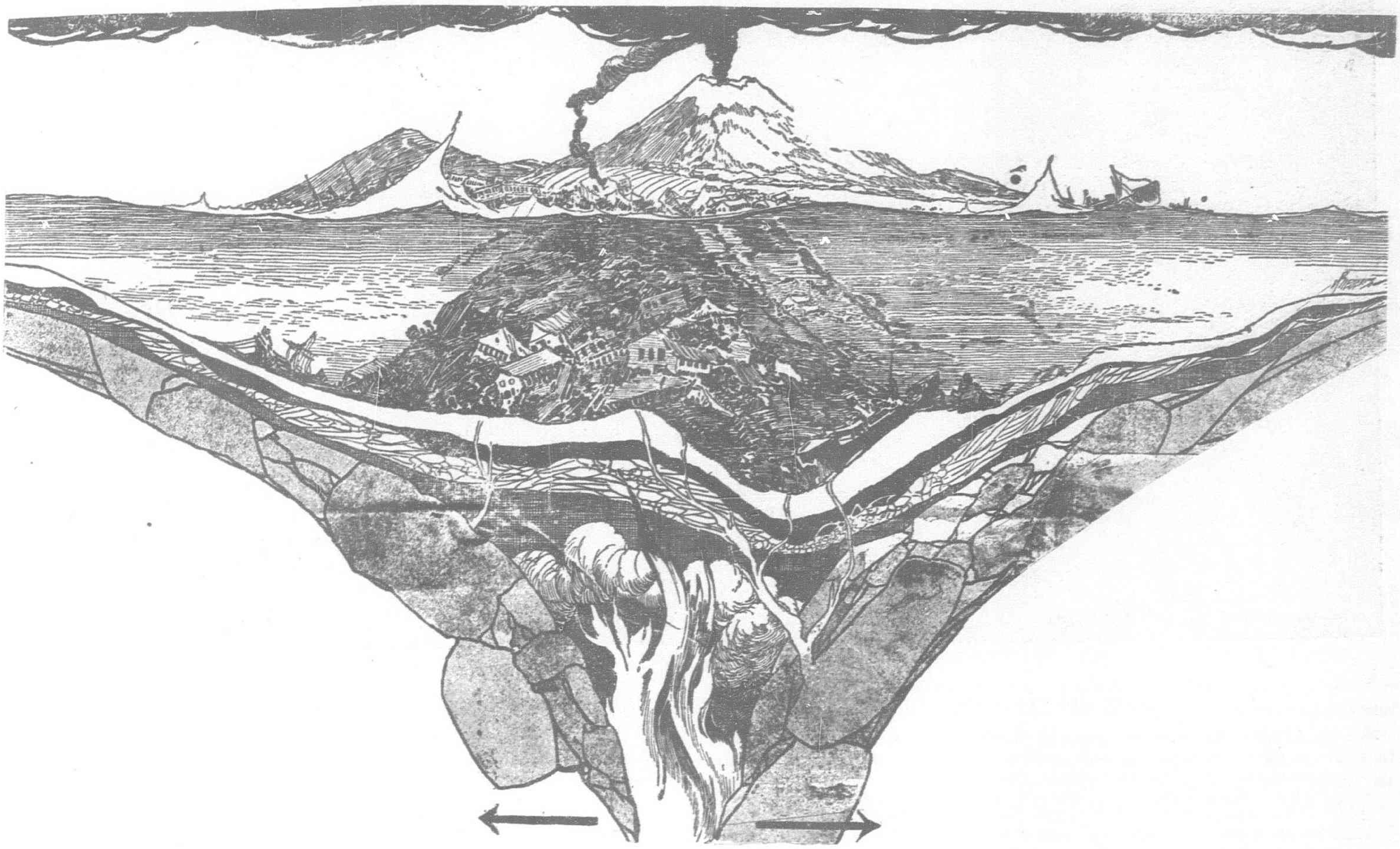
The foreign surname is indescribably stupid; James Lew, John Tang, Wellington Yang, Luther Chang, sound as ridiculous to a foreigner in China as to Chinese. It is one of these things which hits the ear wrong like a Richard Strauss attempt to discover a discord. The same thing is perhaps true in America when a radical names his first-born Karl Marx Lenin Huxley Smith. The poor kid has no chance in life until a genius comes along and nicknames him "Buddy."

The reaction against these foreignized tricks is very great at the present time. Young Chinese are dropping discordant names, are wearing harmonious clothes, are reading and writing in Chinese. They are going back to China. Many foreigners regard this movement unfavorably. But those who understand China can see in this tendency nothing but good, since it is developing a national consciousness, a desire to understand the people and the country and a will to serve both. In the Christian movement in China this tendency is particularly noticeable. Chinese are wearying of the noneclature which makes a man a Presbyterian or a Baptist of a Methodist. They particularly dislike the distinctions growing out of the American Civil War which have nothing to do with China, like northern Baptist and Southern Methodist, etc. Either they are followers of Christ or they are not. The result has been a China for Christ movement in which the Chinese Christians demand a union of all sects and groups and a predominance of Chinese authority in the councils of the church. This movement is in its third year and is fast becoming one of the outstanding features of the religious world in China.

This self-assertion of the Chinese, this insistence upon things Chinese expresses itself even more definitely in the officialdom. In the old days, Chinese officials bowed their heads to foreigners and then double-crossed them. This was called high diplomacy and adepts in it like Li Hung-chang, Yuan Shih-kai or the younger men still in the Foreign Office in Peking, built up great careers upon their ability in this direction. The younger Chinese officials, particularly those in the provinces, dislike this method of dealing with foreigners, preferring to talk straight from the shoulder. Sometimes their talk is all bunk like the brilliant outpourings of the Chinese Chargé d'Affaires in London on the opium question or the notes of Mr. Wellington Koo to the Diplomatic Corps in Peking. But in the interior, particularly in the provincial capitals, much is said which it would be well for the foreigners to listen to.

Foreigners call this self-assertiveness. They say that in the good old days, Chinese would not dare to use strong language

(*Continued on page 50*)



"The Mystery of Continental Blocks Which May Obliterate Japan"

THE recurrence of severe earthquakes in central Japan so shortly after the calamity and series of shocks of September last, will provide scientists with fresh material upon which to base new theories as to their origin. Seismic experts are limited to a very small group whose theories do not always harmonize. The great disaster of September provided the occasion for every scientist, embryo expert and alarmist to get their ideas before the public and from the huge mass of literature on the subject one explanation alone seems most plausible.

Japan is merely the summit of a volcanic mountain chain off the coast of the mainland of Asia. The base of the mountains lies five miles beneath the ocean in the Tuscarora Deep, a great depression in the floor of the sea extending along the coast of Kamchatka, the Kurile Islands and Japan. Within ten miles of the shore of the eastern peninsula inclosing the Tokio harbor the bottom of the ocean is two miles below the surface, and the depth of more than 4,000 fathoms is reached within about twenty-five miles.

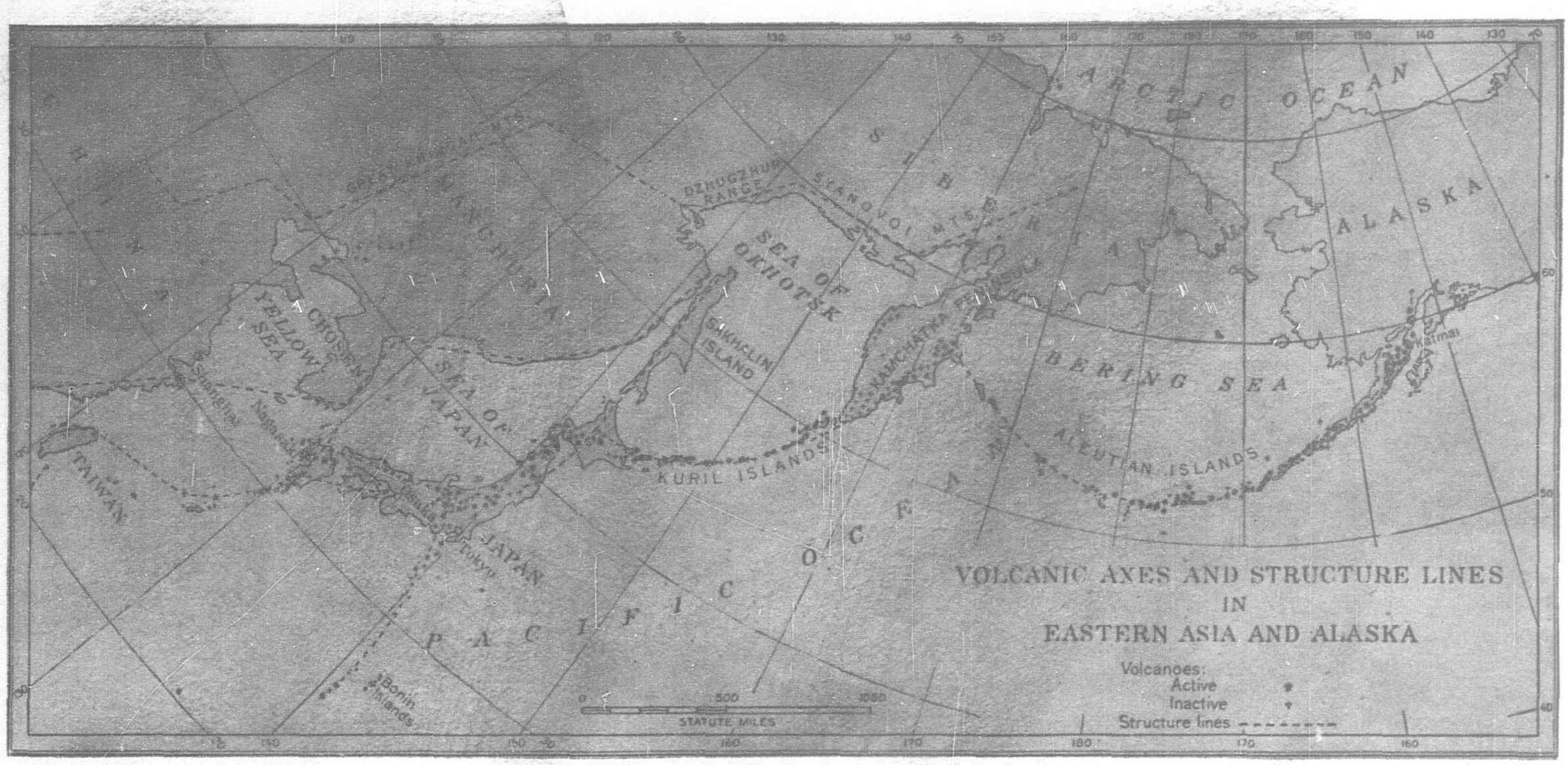
There is doubtless a geologic fault in this Tuscarora Deep just as there is a geologic fault on the Pacific coast of the United States. It was the slipping of the rocks in this American fault that caused the San Francisco earthquake. There are plausible reasons for believing that it is the continual slipping of the rocks in the Tuscarora fault and the consequent setting of the earth that is responsible for the recurrence of earthquakes in Japan.

One expert says that the upheaval in Japan must have come from leakage of sea water in contact with molten rock, under the tremendous pressure of many thousands of feet of water. The idea seems to be that the water pours through the ocean's leaky bottom, thereby coming into contact with hot rocks and turning to steam whose tremendous pressure starts volcanic action and big earth movements.

This theory seems reasonable. All natural phenomena must have natural causes. We know that water in contact with hot surfaces will produce steam and we know of no other cause which we can conceive as able to produce such tremendous results. Volcanoes seem to be safety valves. In Japan, apparently, there was an accumulation of force not connected with any neighboring volcano and hence the awful results to a dense population.

This theory, however, is refuted by other scientists who maintain that anyone who has a commonsense knowledge of water pressure would understand that the ocean cannot leak out through its bottom. The land is higher than the sea. Land water drains into the sea, aboveground and underground. The pressure of a column of water is determined not by its volume but by its height. Anybody who has ever seen a well dug knows that the earth is full of water and that the underground water pressure spreads everywhere through the rock. Thus the ocean water pressing on the bottom should be counterbalanced by water pressure from below. True, salt water is heavier than fresh water. But most of the deep water underground is salt, and there is nearly always additional pressure due to the higher source of the underground water, in the land above sea level.

Thus, if there is a hole in the bottom of the sea, we should expect water to leak, up through it, rather than down, just as it does in the bottom of a boat. And this is exactly what sailors often do find—springs pouring up from the sea bottom, some of them salt and some fresh.



Reprpduced from the National Geographic Society's Publication, "The Valley of Ten Thousand Smokes"

MAP SHOWING WHY JAPAN IS SUBJECT TO FREQUENT DESTRUCTIVE EARTHQUAKES

Japan is not only the scene of many earthquakes, but the island kingdom is literally "peppered" with active and inactive volcanoes (indicated respectively by stars and crosses). Yet volcanic eruptions and earthquakes are not interdependent. The quakes caused by volcanic disturbance, while sometimes of extreme violence, are seldom if ever widespread. It is significant to note that more than half of all the earthquakes that have occurred in Japan since careful records have been kept have originated in the ocean deep to the east of the islands.

The crust of the earth is much wrinkled and broken, and the folding and faulting accompanying this process are greatest along the boundary lines between elevated and depressed segments, developing cracks. Such folding is seen in the curving mountain ranges of Japan, while offshore is one of the deepest "deeps" in the whole ocean, suggesting that one block of the crust has slipped over the next and pushed it down. Next outside the island festoons of Japan is the scalloped coast line itself. Beyond that is another series, including the remarkable escarpment of eastern Manchuria—the Great Khingan Mountains, the dominating geographic feature of the entire region.

A St. Louis scientist puts forth the suggestion that the digging of the Chicago drainage canal was responsible for the disastrous earthquake in Japan, the contention being that the canal from Lake Michigan to the Mississippi River was the means of diverting an abnormal quantity of water from the lake through the river to the Gulf of Mexico, thus changing the balance on the earth's surface. The line of reasoning is a little too deep for us, and we are perfectly willing to let it go at that.

There is another group of serious European scientists of established reputation who have devoted their lives to a careful examination of geological and astronomical evidence.

This group includes such investigators as Dr. Max Valier, of Munich; Engineer Hanns Hoerbiger, of Vienna; Dr. Voight, of Berlin, and Professor F. Queisser, of Prague. Of their latest researches, carried on with the daring born of scientific accuracy and a cosmic largeness of vision, Dr. Valier is the spokesman. In his publications, lectures and interviews, he emphasizes always the necessity for ridding our minds of our current notions respecting the solidity, motionlessness and safety of the earth. One cannot, says Dr. Valier, awaken a man's perception to the undeniable fact, for instance, that the space through which the earth is rushing at the rate of thousands of miles per second is filled with gigantic, invisible blocks of ice, before he has learned to view the earth as the insignificant little speck of dust it really is, when compared to the colossal dimensions of the celestial system of which it is a minute part.

How will this perlious situation end?

To this burning query our scientists provide four answers—all of them are correct. We shall be overwhelmed by the internal fires of the earth; our water will either give out or overwhelm us completely in a second Noah's flood from which no one will escape; our air will give out or become posioned; we shall collide with another heavenly body. All of these things will eventually happen, says Dr. Valier. The only question is, which catastrophe will first have the honor of terminating the existence of man?

Now comes Professor L. Kober, a famous German geologist, with another ordinary contribution to science, in the form of a theory which seems to explain the exact causes of the great upheaval in Japan, and at the same time to shed a startling new light upon the general structure of the earth crust upon which we live.

Two phases of the theory which are of really thrilling human interest are these:

First, that Japan is in an exceptional danger zone, wholly different, for instance, from San Francisco and Southern Italy, and that Japan may some day suffer the fate of the mysterious lost Atlantis and be completely engulfed in a combination of earthquake and tidal wave.

Second, that the earthquake zones of America, which are chiefly the Pacific coast and the Atlantic coast near Charleston, South Carolina, are protected in such a way that a like misfortune will probably never happen to them.

How can science read the future to that extent? The answer is: Partly by studying the past, and partly by daring speculation—but speculation which has a big chance of being right because it is based on accurate reasoning.

The globe on which we live consists of a more or less hot central core and an outside cold envelope or crust. Ever since the earth has possessed this rock envelope, nature has been engaged in spasmodic efforts to fit it about a constantly cooling and shrinking interior, and, as Jacques W. Redway, F.R.G.S., points out, "thereby hangs the tale of the jars and tremors which tradition calls earthquakes.

"Little by little the interior of the earth is losing its heat; hence it is shrinking in size. But the rock envelope must fit itself closely around the shrinking interior, and by this process wrinkles and folds are formed.

"The great mountain chains are the wrinkles of the earth's rock envelope," and it is along these wrinkles, or near them, that the crumpling and breakings known as earthquakes generally occur."

All this has been already known. But now comes Professor Kober's theory, adding new material to it.

He believes, in brief, that he has discovered that the earth's crust is made up to-day of a great number of irregular solid blocks—some almost as big as a continent or ocean—and that in the body of these continental blocks there can be little or no breaking up or earthquakes. He believes that these great blocks are separated by plastic—that is, softer—zones. These plastic zones, of course, are earth and rock, too, but not as firmly knitted together as the blocks.

What he believes happens is this : As the earth cools inside, two of the great blocks move slowly toward each other. They press against the plastic zone between. As pressure increases, the plastic zone buckles, either upward or downward, or both, and from this movement you have wrinkles and breaks in the earth's surface—mountains, earthquakes and other irregularities.

Professor O. H. T. Rishbeth, of Southampton University, outlining this part of the Kober theory in the British scientific journal, "Discovery," says :

"As the earth contracts, the blocks are brought closer together. By their nature and position they have little choice of movement. At first, they will draw together in one and the same horizontal plane. They are the active agents, exerting pressure. The brunt of their onsets must be borne by the plastic zones. These plastic zones one must think of a first as in their hollow stage (like the ocean floor around Japan), sea-filled and having their floors probably weighted by vast masses of rock. As pressure continues, this floor bulges and buckles."

As this continues there finally comes sometimes a great smash, under strain, and the result in the case of the late Japanese earthquakes is that whole cities are destroyed and more than a million people killed.

Never indeed, in known history, has there been such a smash as this one—unless we accept the disappearance of the lost continent of Atlantis, which is described only in legends.

The classic tragedies of Pompeii and Herculaneum in 79 A.D. were slight compared with the fate of Tokio and Yokohama. Pompeii had a population of only 20,000, and the loss of life was only about 2,000. Herculaneum was a mere suburb of Pompeii, and had less than 1,000 dead.

Professor Kober's map of earthquake danger zones shows that Japan, being detached from any great solid, continental block, could conceivably disappear completely under the ocean as the result of an even greater cataclysm than that which occurred.

In considering the geologic possibility of such an ultimate fate for Japan, it is interesting to note that another such detached earthquake zone occurs in the Atlantic Ocean a few hundred miles west of Gibraltar off the Spanish and African coasts, in exactly the spot where the ancient writers say the lost continent of Atlantis once existed.

Plato mentions Atlantis, and it was believed in his time to have disappeared by an earthquake like that which recently shook Japan, but even more tremendous in force. He says :

"This Atlantis was a continent lying over against the Pillars of Hercules (modern Gibraltar), in extent greater than Libya and Asia (minor) put together, and was the passage to other islands and toward another continent (possibly America). This mighty power was once arrayed against Egypt and Greece and all the other countries bordering on the Mediterranean. Then did Athens bravely, and won renown over the whole earth. For at the peril of her own existence she repelled the invader. A little while afterward there was a great earthquake and the warrior race all sank into the earth, and the great island of Atlantis also disappeared into the deep sea."

Many modern scientific writers have believed that this lost Atlantis, about which so many romances have been written, was wholly mythical, but in the light of the Kober theory of earth blocks and earth structure, it is quite likely that it may have existed and disappeared in much the manner described by the ancinets, and that other modern islands and island continents, in similar zones may in time suffer a like fate.

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Chinese Knitting Factories

SEVERAL interesting points in connection with the Chinese knit goods industry have been brought out in a report to the bureau of foreign and domestic commerce made by Assistant Trade Commissioner A. Viola Smith, who is stationed in Shanghai. One of them is that a Chinese laundryman, returning from the United States to China, introduced the idea of modern power-knitting machinery into the country.

Returned students have been responsible for the growth of a demand for underwear of the "athletic" type, and one of these students is credited with being the pioneer manufacturer of knitted underwear involving the use of the Dobby loom. The laundryman is regarded as the father of the machine knitting of hosiery in China, and this branch of the knit goods industry is a great deal more important at present than the attention given to the production of underwear.

Of the four standard styles of hosiery manufactured in China, the most curious is the "bound foot" sock, which is worn by Chinese women with tiny feet that resulted from the old foot-binding custom. This practice is now prohibited, according to Miss Smith, but it is still seen in parts of the interior. The toe of this sock, or half hose, is very sharp, and is usually sewed into shape. It is sometimes made by picking the needles more than half-way around, and sometimes by being ironed out.

By far the most popular style of hosiery in China is the common type of half hose, which is worn both by men and women. Sizes run from eight to ten. The Chinese foot is much smaller than the foreigner's foot generally, and for this reason small sizes are the better sellers. Sizes nine and nine and one-half fit the average Chinese foot. The so-called extension sock is similar to the common half hose, but has an extended leg that ends in a welt instead of a rib. This style is chiefly worn by Chinese women. The fourth standard style made is the regular type of women's stocking, although the leg is usually found to be short for foreign wearers.

No full-fashioned lines are produced in China, according to Miss Smith. The output is confined entirely to seamless hose, although Shanghai mills recently have turned out a boarded stocking, which has later been stitched in the back to produce a mock-seam effect. Such hosiery retains its shape after laundering better than the seamless boarded hose, but it produces an ill-fitting heel and too tight a leg for the foreign trade.

"There are to-day scattered throughout China numerous hosiery and knitting mills, both hand and power driven, but the centre of the modern power-mill industry is located in Shanghai in Kiangsu province. The two largest hosiery mills were established in 1915. Both are located in Shanghai, and each is equipped with about 200 power-driven modern American machines. They are turning out various classes of hosiery and are working to full capacity. One of them is reported to have an output of 1,000 dozen pairs per day of ten hours.

"The production of these mills is chiefly consumed by the Chinese population, although there is a large volume purchased by the foreign element, owing to the cheapness in price. The men's half hose is more satisfactory to the foreign trade than are the ladies' stockings. Chinese hosiery products have been exported to India, Manila, Singapore, Australia and Antwerp."

Miss Smith adds that the vast population of China does not constitute a market for foreign hosiery, nor does it promise to in years to come. The import trade is virtually confined to the foreign population in the treaty ports. Cheap grades of imported hosiery have very little chance of competing with the native product, as the Chinese goods are usually found to be superior to the cheap lines of foreign hose that may be found available.

"Native underwear mills have not grown to the proportions in China that the modern hosiery mills have," Miss Smith continues in her report. "This is due, perhaps, to the fact that the Chinese have had little or no appreciation of foreign-style knit underwear. For centuries they have worn a two-piece pajama-like suit cut in a typical Chinese style, which has been made of various grades and styles of cotton cloth. Coping with the changes in the rise and fall of the thermometer has to them merely meant the putting on or taking off of additional coats and pants. However, a few Chinese mills are turning out knitted singlets—a low-neck, no-sleeve, fine-rib vest—principally worn by Chinese men. A two-piece suit also is made along the lines of a Chinese garment.

"The principal underwear mill in China is located in Shanghai. It was established in 1921 by a returned student, who is reported to have imported the first Dobby looms into the country. This mill produces four styles of underwear and has a capacity of about 3,000 pieces a day."

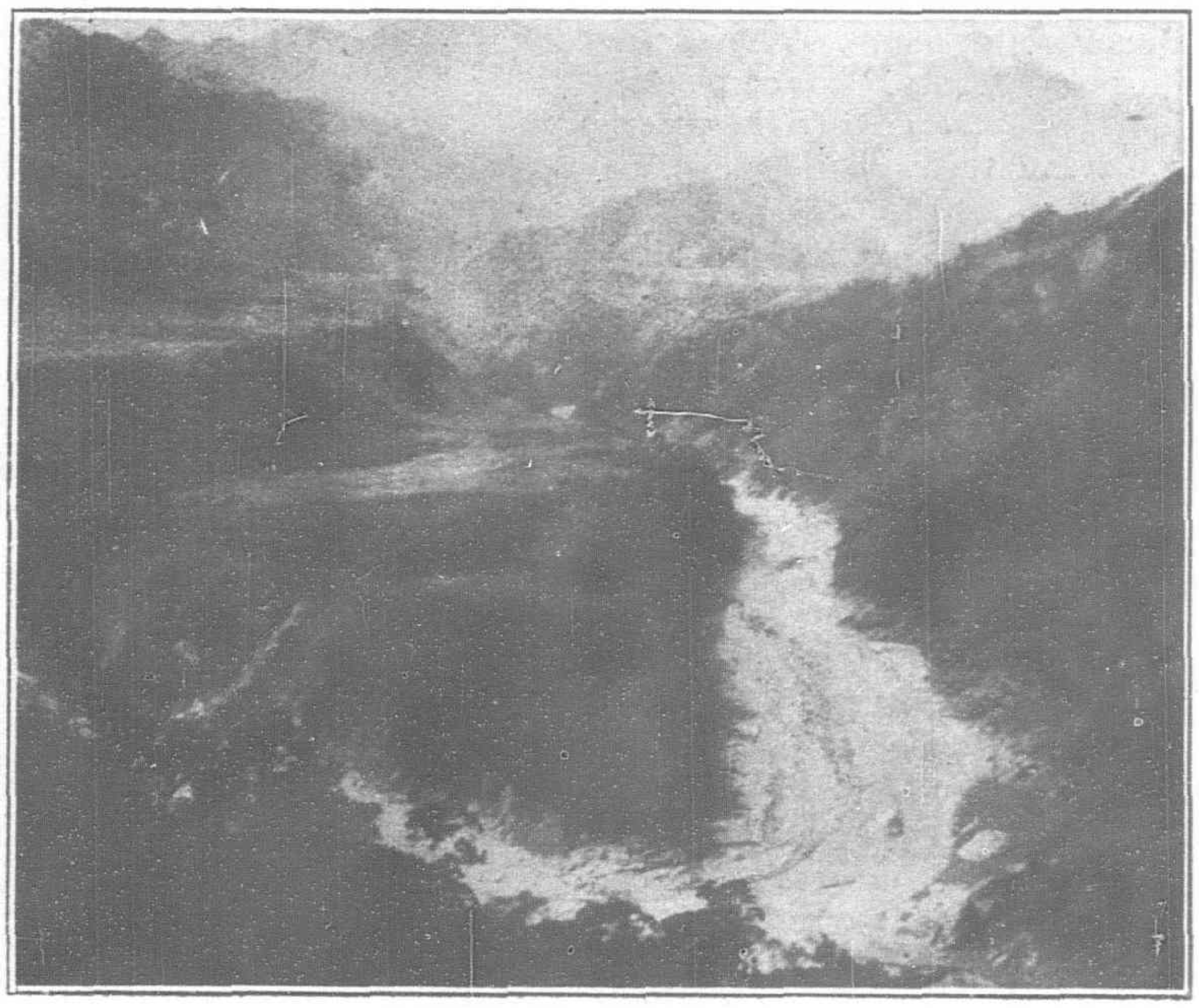
Administration By Electricity

By Owen Rutter, F.R.G.S., F.R.A.I., Author of "British North Borneo"

WHEN China ceded the island of Formosa to Japan in 1895, the Japanese found themselves confronted with many problems. One, and not the least important, was the settlement of the pagan tribes which inhabited the greater portion of the Eastern highlands.

These people, who, for want of a better word, may be called the aborigines of Formosa, have probably been in the island for at least 20,000 years. Their origin is almost certainly from the north-west mainland of Asia and they are mainly of Indonesian stock (being curiously akin to the tribes of Upper Burma and of Borneo) although there are also Polynesian traces amongst them. Before the coming of the Chinese to Formosa they were in possession of the fertile plains which form the western half of the island, and only took to the hills at a later day as a refuge from the persecutions of the new settlers.

The Chinese treated the aborigines with every conceivable barbarity; they oppressed them, they misgoverned them, they took their lands, stole their property, and even ate and traded in the flesh of those whom, on one pretext or another, they had killed.* There arose between the two peoples a bitter enmity which lasted through the centuries until the coming of the Japanese, the natives regarding all Chinese as their foes and taking their heads whenever an opportunity occurred.



On the Fringe of the Savage Country.

When the Japanese had put down the bands of Chinese brigands and rebels who roamed the plains, they turned their attention to the aborigines and established along what was known as 'the savage border' a line of guard-houses at strategic points, connecting them by a track cut through the forest, and garrisoning them with detachments of police.

"Where it becomes necessary to perfect the defensive arrangements," says Mr. Takkoshi in *Japanese Rule in Formosa*, "wire entanglements, *charged with electricity*, are used or mines are run. These have a great effect in giving an alarm of the invading savages. In certain important places mountain or field guns are placed. One gun is sufficient to withstand the attack of several tribes." The italics are mine.

This guard line is in force to-day. At intervals the line is advanced, either by means of military expeditions or, more rarely, by arrangement with the inhabitants. The natives who thus come under Japanese influence are then 'tamed' and educated, being taught to speak Japanese and generally 'assimilated.' When the advance of the guard line is opposed a guerilla warfare ensues, in which the native warrior, at home in his own country of jungle hills, has a great advantage over the heavily equipped Japanese soldier, who is unused to jungle work or to climbing hills.

Hitherto these methods have not been successful in settling the aborigines to any great extent, as the Japanese admit. This lack of success is, for Japan, a very serious matter. She does not possess so much superfluous territory that she can allow 100,000 pagans to keep her out of 7,000 square miles of country which, besides allowing for ample native reserves, could support a thriving agricultural population, to say nothing of its vast stands of valuable camphor trees and its possible mineral wealth.

Yet this is the position in Formosa to-day: the Japanese are defied by the native tribes, and inside the electrified barbed wire entanglement with which they have surrounded these children of the forest they can only venture with their lives in their hands. It is a humiliating position.

(*Continued on page 49*)

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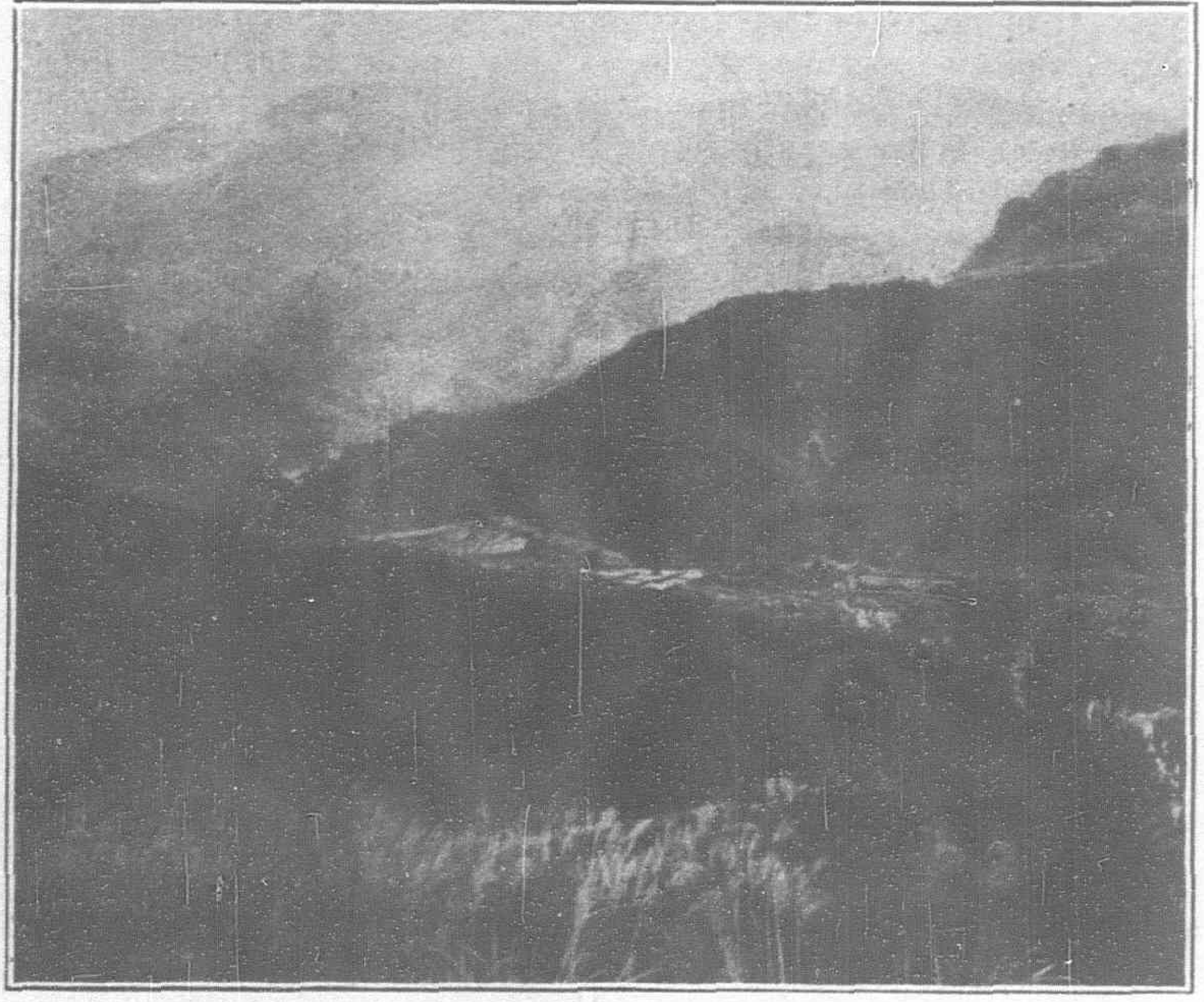
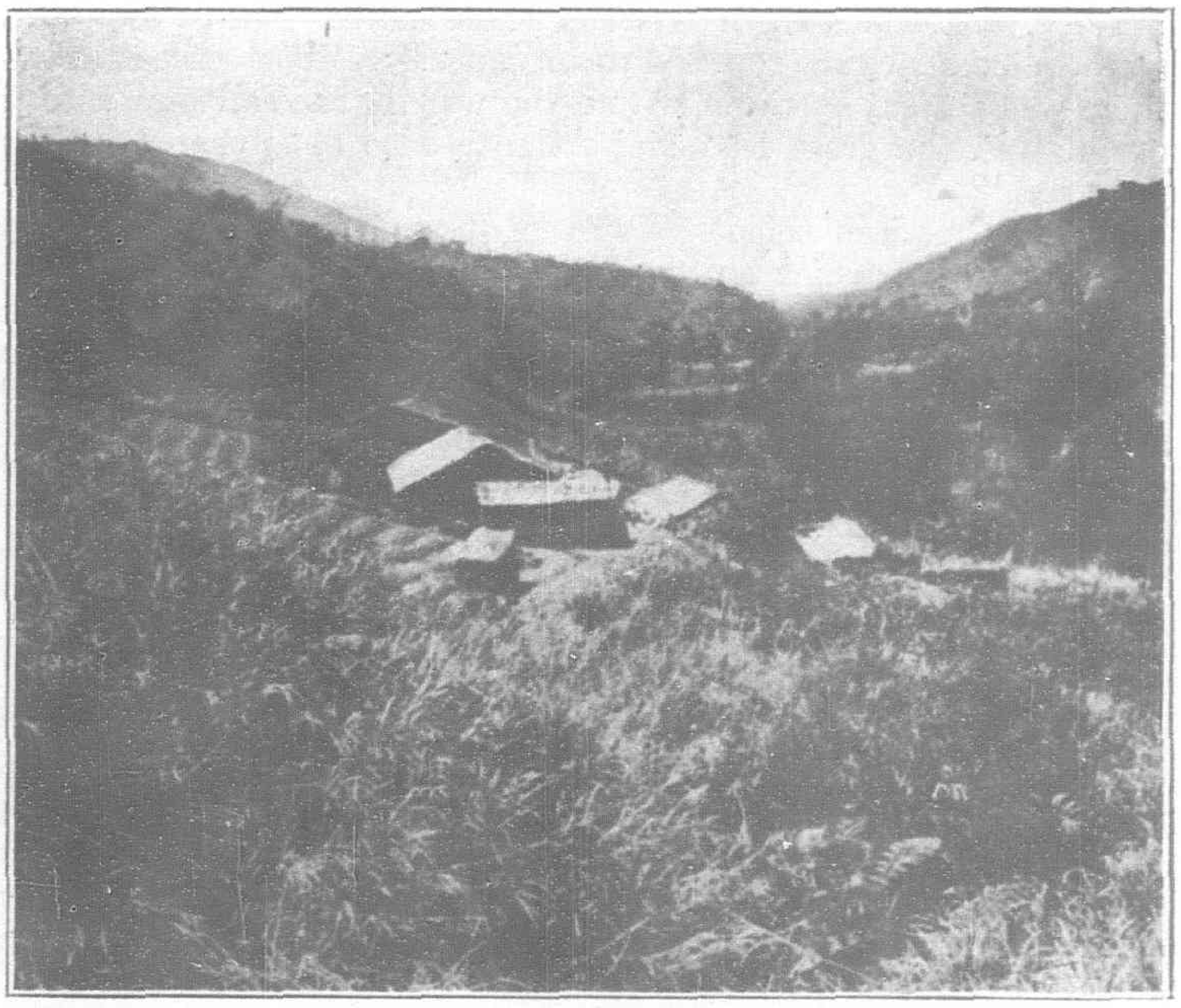
* See J. H. Davidson's The Island of Formosa, p. 255.



The Formosan Hills



A Native Village.

Wusih, a "Small Shanghai"

By M. H. Chou, M.S.

THE development of industries in certain localities in China is governed by many factors. Among them the most important are that the location is easily accessible to the centre of market and that the industrial development is hastened by local leadership. For example, some fifty years ago Shanghai was just a marsh place. Due to its fine location accessible to water, it has become the centre of international commerce. Through the industrial leadership of Chang Chien, Nantungchow has become a modern city especially noted for the development of textile industry. Although Soochow is located nearer to Shanghai than Wusih, yet it is not so noted for industrial prosperity as Wusih because the people in Soochow invest money more or less in banking or real estate business. While these in Wusih are more enterprising and advancing in industrial voyage. Among the noted industrial magnates the Hsieh's family and the Yong's family are by far the most distinguished of all.

Mr. Yong is proclaimed as the "Flour King" of China to-day for the output from his mills alone is 50,000 bags per day. Mr. Hsieh Nan-ming is more noted for his silk and cotton business. His latest enterprise is a cement company called theTa Hu Cement Company which is on the way of completion. With the local leadership furnished by Mr. Yong and Mr. Hsieh, Wusih has attained an unparalled industrial prosperity only next to that of Shanghai. It is commonly called the "Small Shanghai."

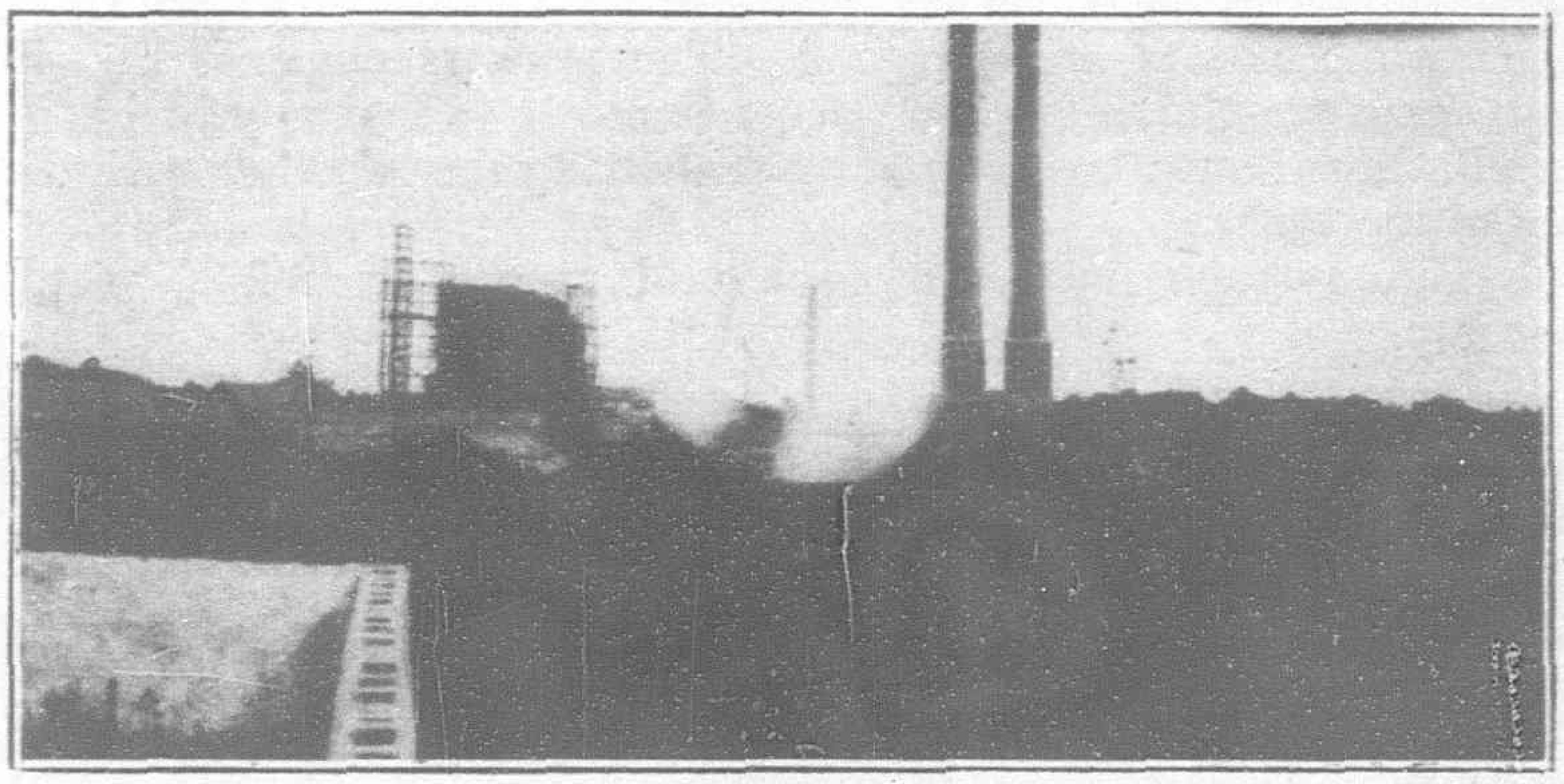
Situated on the Soochow river at a distance of 200 *li* on the Shanghai-Nanking Railroad. There lies the familiar city of Wusih. From time immemorial to a little over twenty years ago, Wusih is entirely an agricultural country. It is inhabitated by a population of 800,000 most of whom are farmers. Rice and silk are the most abundant staples they have raised. With the introduction of machinery from the west and stimulated by the success which has accompanied the foreign cotton mills in Shanghai, the people in Wusih began to start something like modern mills themselves. One mill is springing after another. Wusih at once makes a name for itself as an industrial city.

A brief survey of the industries in Wusih will undoubtedly prove interesting to the Chinese public.

(*a*) *Cotton Mills.*—There are six cotton mills in Wusih, possessing a total sum of 115,000 spindles and 750 power looms. Some of them are using steam engines as the driving power, while the others are using turbo-generators. The following table will tell the standing of the six mills :—

Name	Date	Capitalization	No. of Spindles
Nieh Gein ...	1899	$ 500,000	13,870
Chung Sing ...	1905	1,800,000	30,330
Kwan Gein ...	1916	800,000	22,000
Shung Sing ...	1921		50,000
Yue Kong ...	1920	800,000	14,000
Ching Foong ...	1921		14,000

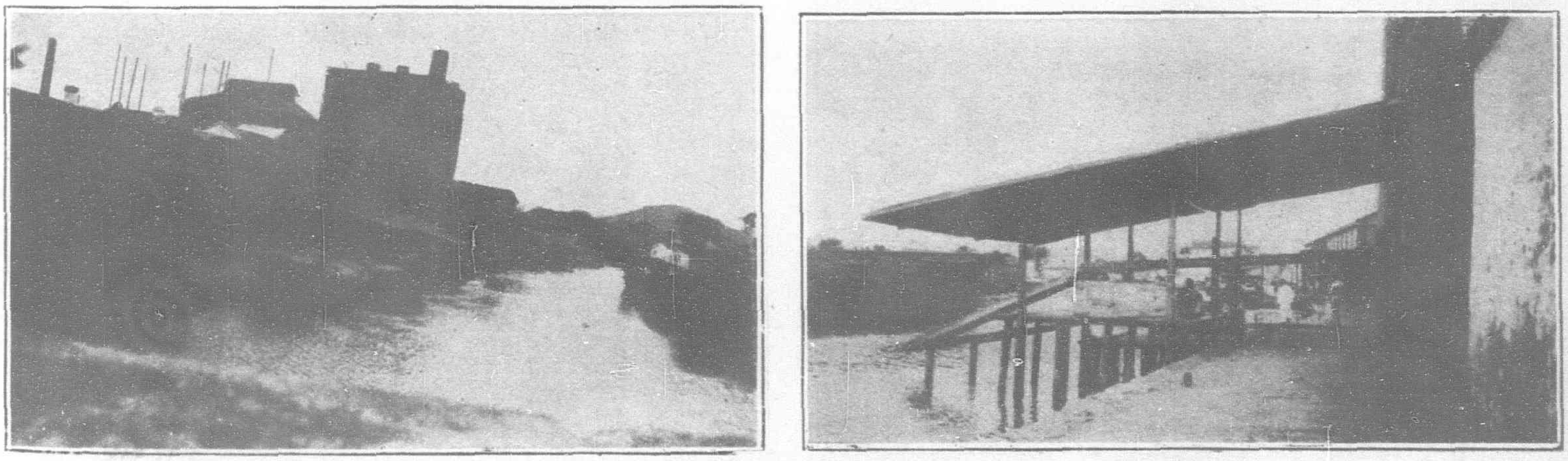
Generator of Power	Consumption of Coal (tons per day)
Steam Engine	9
Turbo-generator 3,000 kw. (German make.)	20
Steam Engine (compound corliss type of English make.)	14
Turbo-generator (American make.) 3,200 kw.	
Steam Engine (English make, not yet in operation.)	
Turbo-generator 1,000 kw. (not yet in operation.)	



Plant of the Ta Hu Cement Company at Wusih

(*b*) *Silk Filatures.*—There are altogether fifteen silk filatures in Wusih as tabulated as follows:

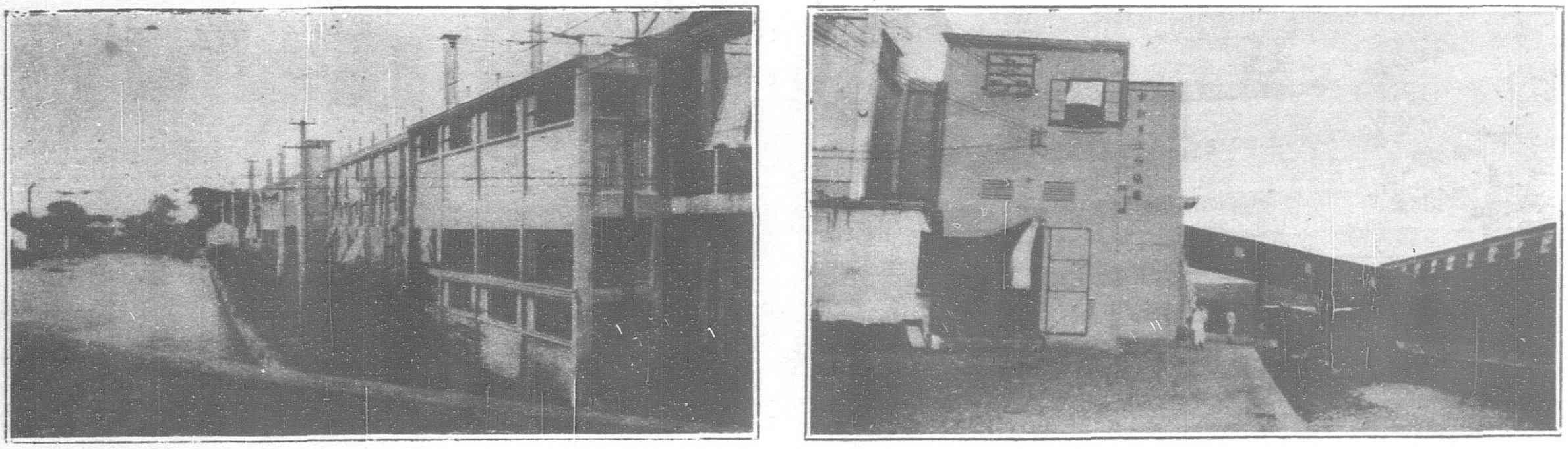
Name	Yr. Est.	Capital	No. of Reels	Tons of Coal per day
Yue Chang ...	1904	$80,000	330	9
Kien Kee	1907	75,000	314	12
Yuen Kong ...	1907	77,000	320	10
Chung Nieh ...	1908	100,000	520	18
Kein Sung... ...	1908	50,000	208	7
Kein Foong ...	1913	50,000	256	8
Yung Shung ...	1914	52,000	256	8
Zai Chang ...	1914	50,000	248	8
Wah Shung ...	1918	50,000	288	8
Zai Kong Sheng ...	1916	40,000	280	9
Ching Foong ...	1919	50,000	240	6
Yung Chang ...	1919		240	6
Chung Lung ...	1920	42,000	304	7
Tai Fu	1920		208	6
Yung Ji	1920	48,000	240	6



General View

MOW SING FLOUR MILL, WUSIH

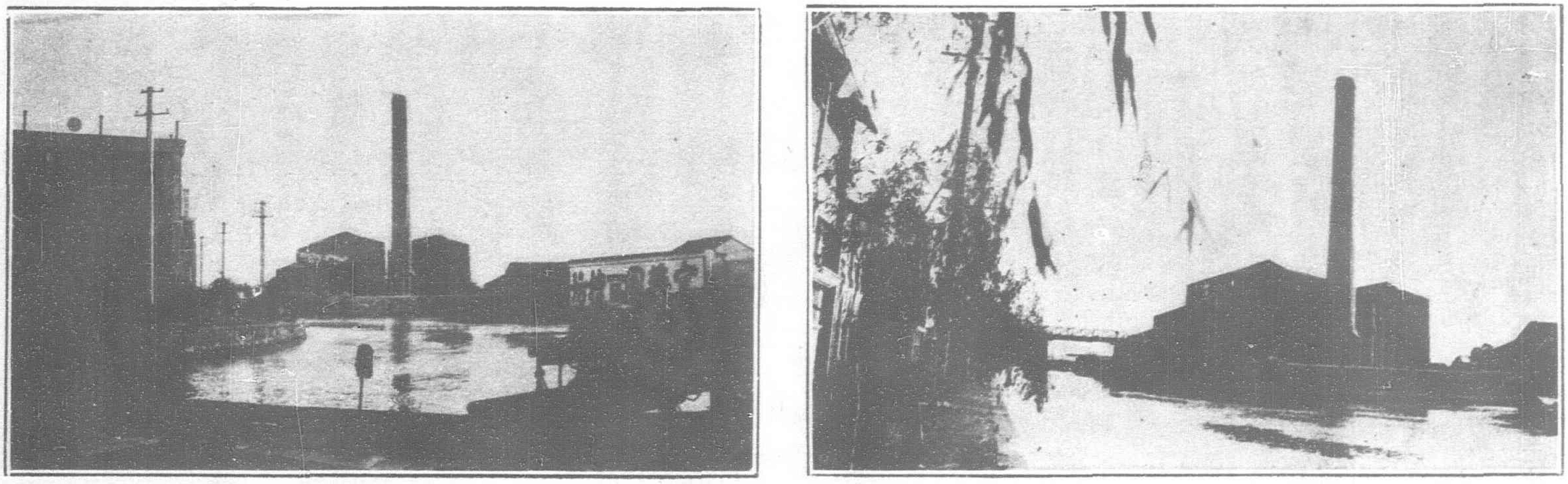
Roller Conveyor



Sung Sing Cotton Mill, No. 3, Wusih

All of them are run by steam engine. Raw cocoons are bought from those hongs where large or small quantities of cocoons are bought directly from the farmers. They are put into boilers and their thread is reeled on the reel run by a shaft to which D. C. generating motors are attached. The workers engaged in silk mill work are children. They have to see to it that any breakage in silk thread must be repaired by connecting the two ends with the aid of the tongs.

The average output of each mill ranges from 2-3½ piculs per day.



Sung Sing Cotton Mill Power Station, Wusih

The coal consumption of these mills averages from 15 to 20 tons.

(c) *Flour Mills.*—There are altogether five flour mills which have a capacity of 500,000 bags, each of 50 pounds. The milling machinery is of American make. The power used by the Chu Foong Mill is supplied by the Ching Foong Cotton Mill. Mow Sing No. 1 and No. 2 are driven by the power coming from the Shung Sing Cotton Mill. The names of the mills with their output are given below :—

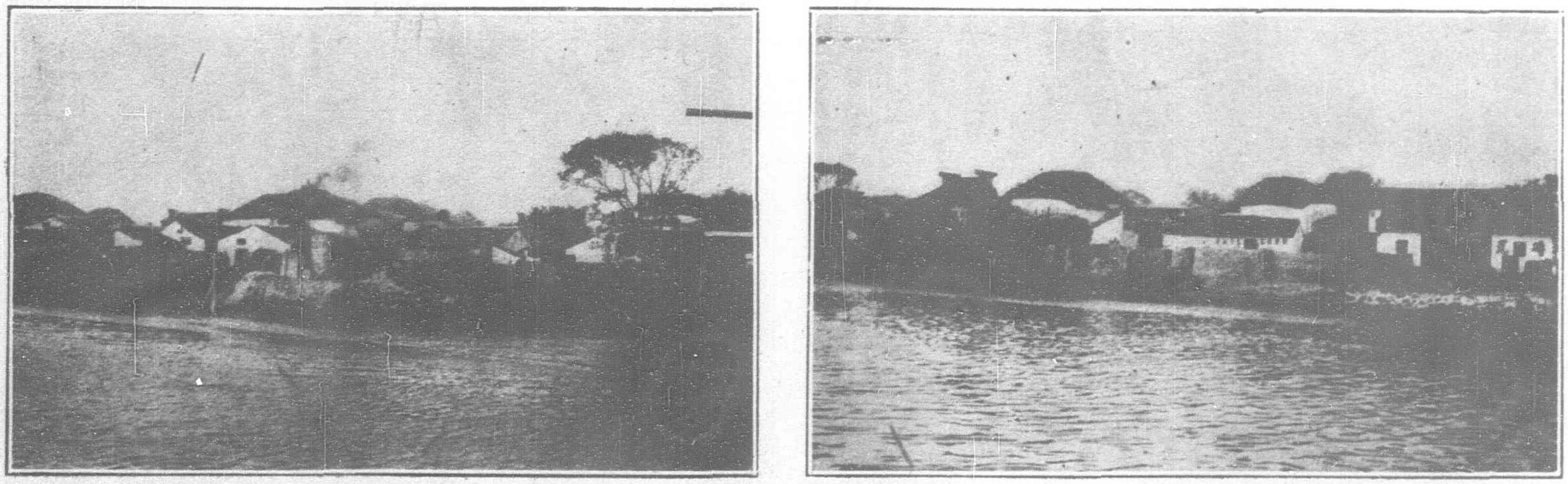
Name		Bbls.	Power	H. P.	Tons of coal per day
Mow Sing 1	...	1,200	Electric	600	
Mow Sing 2	...	900	,,	500	
Chu Foong	...	1,200	,,	600	26
Chang Foong	...	400	Steam	200	10
Tai Loung	...	400	,,	200	11

(d) *Oil Mills.*—There are ten oil mills in Wusih, all driven by steam. Their names, capital and output are as follows :

Daily Output.

(*in piculs*, 1 *pic.*=133⅓-*lb.*)

Name		Cakes	Oil	Date	Capital	H.P.	Coal in tons
Shung Foong	...	675	66	1914	$100,000	50	3



Native Brick Kilns, Wusih

Daily Output.

(*in piculs* 1 *pic.*=133⅓-*lb.*)

Name	Cakes	Oil	Date	Capital	H.P.	Coal in tons
Kien Foong ...	563	55	1914	75,000		
Heng Foong Tai	112	11	1914	10,000	10	1
Cheng Mow ...	563	55	1915	75,000	driven by Chen Tai Rice Mill Engine.	
San Hou ...	224	22	1915	30,000		
Tou Yuen ...	248	24	1918	36,000	25	2
Cheng Kong ...	332	33	1919	70,000	30	2
Heng Tuh ...	1,350	135	1919	500,000	100	7
Yuen Tai ...	112	11	1920	10,000	10	1
Yung Foong ...	100	10	1920	10,000	10	1

The Heng Tuh Oil Mill being the largest in Wusih has 100 presses and four crushers all of which are driven by one 100 h.p. steam engine which consumes 6-7 tons of coal a day. Beans are first crushed and ground by two stone crushers driven by a 10 k.w.d.c. generating motor and then subjected to pressing.

(*e*) *Rice Mills.*—There are eleven rice hulling mills in Wusih as follows :

Name	Daily output in piculs.	No. of polishing machine	H. P.	Tons of coal per day
Pao Sing	600	8	50	2½
Yung Ho	300	5	35	1½
Sing Tar	300	4	30	1½
Cheng Tai	300	5	45(drives oil mill at night)	3
Yue Chang	400	6	50	2½
Sheng Chang Yue ...	400	6	35	2
Tuh Yuen	600	8	50	3
Ming Yi	200	3	20	1½
Tuh Sing	200	3	25	1½
Yi Yuen	300	4	30	2
Hung Yi	300	5	35	2

The average rice polishing machine requires about 6-8 h.p. each. These rice mills are in operation only for a period of four months for the year.

Weaving Mills.—There are 16 mills altogether with a total of about 2,500 wooden looms all being operated by hand with the exception of the Lee Sing Mill which is undoubtedly the leading concern in this industry. They have on order from England 200 power looms which will be used to turn out cloth similar to imported piece goods. An Englishman was engaged by this mill for a period of three years with an understanding to teach the Chinese artisans until they are proficient. An oil engine is now installed for drawing two winders. The engine of Chinese make is of 25 h.p. consuming 60-lb. of oil daily and a ¾ k.w. Delco set for 40 lamps is installed for lighting purposes.

Foundries and Machine Shops.—There are five foundries in Wusih all on a small scale with the exception of Kwan Gien.

Yih Gein Foundry and Machine Works has five lathes and one planer. It is driven by a steam engine of four horse-power with a vertical boiler consuming a ton of coal per day. There are about thirty employees engaged by this foundry.

Wei Hing Foundry has three lathes driven by hand.

Soap Works. There are four soap works in Wusih :

Name	Date	Capital	Monthly output boxes	Method of drying	Coal consumption per day
Dah Tung ...	1913	$20,000	3,000	Sunlight	600-lbs.
Kwan Gein ...	1919	10,000	1,200	Steam	1-ton.
Yue Chang ...	1920	10,000	1,200	Sunlight	500-lbs.
Foh Lee... ...	1920	5,000	600	,,	200 ,,

Magnesia Works.—"Chung Hwa Dee Chi Mei Chang," whose finished product is supplied to a tooth powder factory at Shanghai. Daily consumption of coal, about a ton.

Umbrella Works.—Named Ming Sung started in 1919 with a capital of $30,000. The monthly output, 400 dozens, all made by hand.

Brick Factory.—There are two brick works situated about twelve miles away from Wusih. Bricks are made by hand.

Knitting Factories.—There are eleven sock knitting factories all operated by hand except Yeh Sing which employes a 15 h.p. Blackstone oil engine consuming 80-lb. of crude oil every day.

Electric Light Co.—Established in 1907, capacity, 500 k.w., supplying the power to 13,280, 16 c.p. lamps.

Ta Hu Cement Company.—The newest and the bigest industrial achievement added to Wusih is the establishment of the Ta Hu Cement Company, sponsored by Mr. Hsieh Nan-ming and his eldest son Hsieh Hsiuh-chien together with some Wusih and Shanghai merchants. It was started in 1920 and will be completed some time before the first of the year. A detailed description of the factory was published in the March and April issues of THE FAR EASTERN REVIEW for the year of 1923.

Equipment and Operation of the Port of Sabang

(*Continued from page 26.*)

government denies that these works were required in the interest of trade and shipping or if they consider the expenses too high, the decision whether the government will be obliged to take over these works is left to arbitrators. On the other hand if the government desires any extension, which the lease-holders do not wish to execute, then the government has the right to do itself and to operate this harbor work for its own account.

The Company are obliged to operate all the leased harbor works for the use of shipping and trade and to meet all their reasonable requirements.

They also have to provide for pilotage and signal station. This is a great advantage for steamers entering the port, as the manager will know at once all steamer's requirements enabling him to indicate at once the right berth and to make arrangements for the discharge, the coaling and the supply of water and stores, ensuring the quickest despatch.

The mere fact that the port of Sabang has to compete with neighboring ports as Penang, Singapore and Colombo is a guarantee, that wharfage and other expenses will be kept as moderate as possible.

Moreover, Sabang being only an intermediate port of call and not one of ultimate destination, it is evident that the only way to secure business is to keep prices for the supply of bunkers and stores below those of the above named neighboring ports.

Economical management and increased business are therefore the principal means for the Sabang Co. to augment their profits and their endeavors thereto will necessarily lead to the most careful attendance to shipping and to allow their customers all possible facilities.

To conclude it may still be mentioned that in order to ascertain the right fulfilment of the contract with the government there is at Sabang a government harbormaster, who is entitled to inspect the whole establishment, whereas a government commissioner controls the administration and management at the head-office in Amsterdam.

As the above described system of equipment of the harbor as well as the way of operating same have proved to be successful specially during the period of quickly increasing shipping before the war, it has been deemed useful to issue this publication for the general engineers' conference held at Batavia in May 1920.

Wire Manufacturers in Japan Increasing Output

Electric wire manufacturing companies in Japan, which were limiting their production 40 per cent. before the earthquake, are now working full time in order to cover the large demand which has been caused by the restoration work in Tokyo and Yokohama. The Nikko factory of the Furukawa Mining Company (Furukawa Kogyo K. K.), the Hidachi factory of the Kuhara Mining Company (Kukara Kogyo K. K.) and the Sumitomo factories are operated at full capacities. The Honjo and Shinjiku factories of the Fujikura Electric Wire Company (Fujikura Densen K. K.) and the Tokyo Electric Company (Tokyo Densen K. K.), are busily engaged in the restoration of their factories. The Yokohama workers of the Furukawa Mining Company have been transferred to other factories of the Company in Kyushu and Kansai.

Progress of Irrigation in the Philippines

Insular Irrigation Projects

A. D. Williams, Chief Irrigation Engineer

THE irrigation construction program which had been delayed during the latter part of 1921 and the first part of 1922, due to the policy of retrenchment adopted by the government, was actively resumed in April, 1922, upon the release of bond issue funds appropriated by Act 3011, entitled "An act to appropriate the sum of twenty million pesos for the construction of irrigation systems." Funds totaling P.2,300,000 were provided in April for continuing construction work on projects actually under way. Further allotments, amounting to P.1,140,000, were authorized from the same source and for the same purpose in September, making the total of funds provided dring the year, P.3,400,000. This enabled the division to complete the Santa Barbara project in Iloilo province and Dingras project in Ilocos Norte, and also to make very satisfactory progress on the construction of other projects previously authorized. The status of all insular irrigation projects which have been approved for construction since the reorganization of the division in 1918 is given in the following table:—

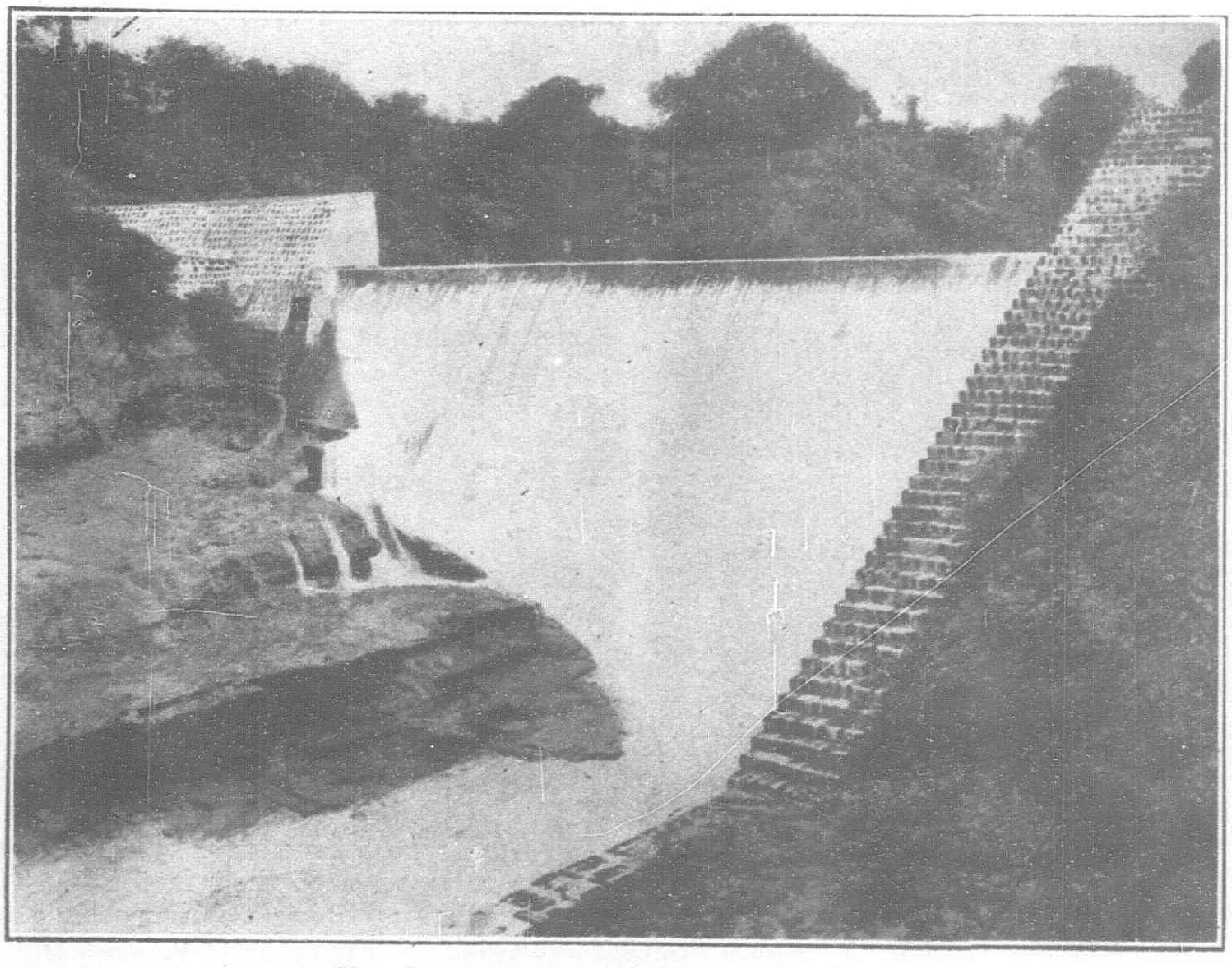
Project	Province	Irrigable area *Hectares*	Estimated cost	Allotments authorized	Total expenses and liabilities	Percentage of work completed
Trinidad	Mountain	200	P40,000	P40,000	P40,000	Completed (1921).
Santa Barbara	Iloilo	4,986	692,000	692,000	692,000	Completed (1922).
Dingras	Ilocos Norte	1,010	130,000	130,000	130,000	Completed (1922).
Baruyen River	do.	1,000	85,000	81,000	80,292	97 per cent.
Naic...	Cavite	800	300,000	300,000	268,396	92 per cent.
Aganao River	Iloilo	5,500	917,000	917,000	754,765	50 per cent.
Talavera River	Nueva Ecija	10,000	1,028,000	1,028,000	823,312	80 per cent.
Tagudin	Ilocos Sur	1,300	300,000	250,000	162,062	37 per cent.
Amburayan River	La Union	4,500	750,000	619,000	432,347	40 per cent.
Angat River	Bulacan	25,000	4,500,000	2,250,000	2,232,438	22 per cent.
Lamao	Bataan	160	30,000	5,000	3,627	2 per cent.
Laoag-Vintar	Ilocos Norte	6,000	1,000,000	300,000	25,736	1 per cent.
Total		60,456	9,772,000	6,612,000	5,644,975	

Trinidal Irrigation Project.—This project was completed in January, 1921, and a brief description of same given in the report of this division for the year 1921. The larger part of the land irrigated by the system is owned by the Trinidard Farm School, and, upon completion, the system was turned over to the superintendent of the school for operation and maintenance, in accordance with special authority granted by the secretary of commerce and communications in approving the project for construction.

Santa Barbara Irrigation Project.—Construction work on this project was completed in June, 1922, and water was furnished to landowners under the system for the 1922 rice crop. It was necessary, however, to delay the official opening of the system to December 1, 1922, on account of the work involved in the preparation of a complete list of water users giving the area of irrigable land held by each. The list as prepared shows that the system benefits 733 landowners, or 1,746 separate parcels of land with a total area of 4,985.82 hectares. The irrigation notice covering the completion of the project provides that the annual charge per hectare on said land to cover the costs of construction with interest shall be P.7.01 and that same shall be paid in forty equal annual payments due on or before March first of each year. The estimated annual cost of maintenance and operation is P.2 per hectare, making the total annual charges approximately P.9 per hectare. That the payment of these charges represents an excellent investment for the landowners was well demonstrated by the 1922 rice crop produced under the system. While actual figures are not yet available, it is safe to say that the yield of rice under the system was fully fifty per cent. higher than on unirrigated land in this locality.

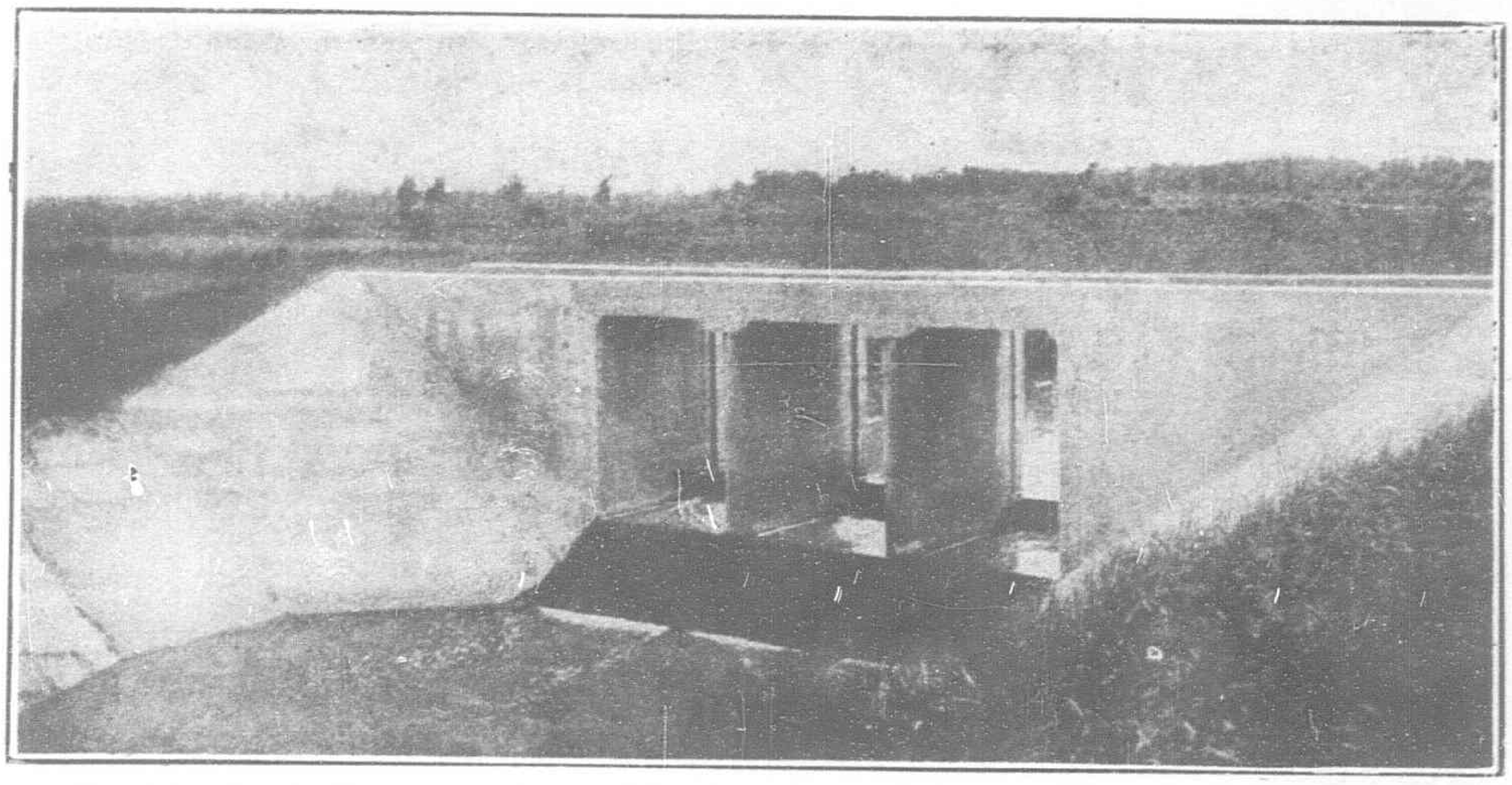
Diñgras Irrigation Project.—Construction work was completed on this project in December, 1922, but water was made available for practically the entire tract of irrigable land in July, 1922, and an excellent crop of rice was harvested. The official opening of the system was held on January first, 1923. There are 2,312 water users under the system who own 5.440 separate parcels of land containing a total area of 1,009.47 hectares. The annual charge per hectare on this land to cover the cost of construction with interest is P.6.50 and the estimated annual cost of maintenance and operation, P.2.50 per hectare, making the total annual charges approximately P.9 per hectare. Payments are to be made by landowners in forty annual installments due on or before March first of each year.

Baruyen River Irrigation Project.—This project, including a cadastral survey of the irrigable land and the preparation of a list of water users was practically completed at the end of the year. The work remaining unfinished consisted of lining a section of the



Naic Diversion Dam, Cavite Province, P.I.

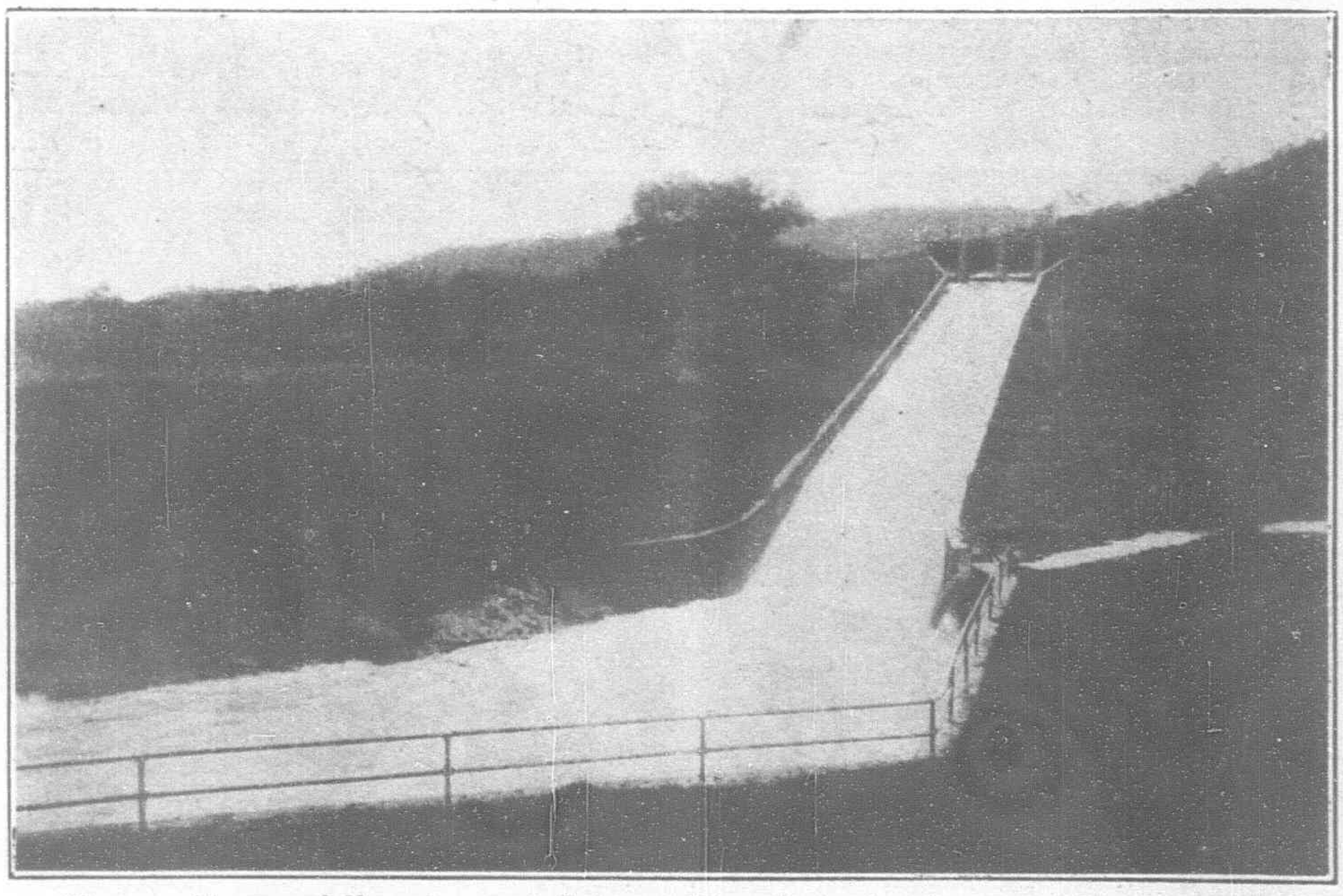
main canal to prevent the loss of water through seepage and the construction of a small lateral canal. It is expected that this system can be officially opened in March, 1923. The final estimate of cost of P.85,000 exceeds the original estimate by P.4,000, due to the necessity for lining portions of the main canal.


Combination bull cart crossing and drop, main canal, Aganao River Irrigation System, Iloilo, P.I.

Naic Irrigation Project.—Construction work on this project was taken over by administration from the Manila Engineering Co., the contractors for the masonry dam and canal excavation work, on May 8, 1922, due to unsatifactory progress. Three extensions of time amounting to 288 days had been authorized for the completion of the dam and two extensions, totaling 161 days, for the canal excavation work, making May 31, 1922, the time for completing both contracts. At the time of taking over the work, it was estimated that the dam was approximately 80 per cent. completed, not including necessary extra work, and the canal excavation work was about 45 per cent. completed. It was therefore apparent that the contractors could not complete the work in contract time. It was desired to complete the dam before the heavy rains started, but an early rainy season made it advisable to discontinue construction work on the dam early in July, after the work had been carried by administration to the point where it could be safely left through the rainy season. Construction work on the dam was resumed in November and same should be completed in February, 1923. The canal excavation work and the construction of all canal structures were completed before the end of the year. The system should therefore be ready to deliver water for the next rice crop.

Aganao River Irrigation Project.—The canal excavation work which was performed under contract with the Manila Engineering Co. was completed in October, 1922, they having been granted an extension of time of 70 working days in accordance with the terms of the contract. The diversion works, which are being constructed under contract with the Atlantic, Gulf and Pacific Co. of Manila, were approximately 50 per cent. complete at the end of the year, and at the present very satisfactory rate of progress, the diversion works should be completed in April, 1923. The plans of all canal structures were completed and this bureau advertised for bids in December with a view to completing the entire system in time to furnish water for the 1923 rice crop.

Talavera River Irrigation Project.—Messrs. Martin and Hanna, contractors for the construction of the diversion works and main canal structures, completed all canal structures on contract time, June 30, 1922, but an early rainy season seriously interfered with work on the diversion weir and it was necessary to continue work on same through the rainy season. Extensions of time totaling 90 working days were authorized and the work finally completed and accepted on December 30, 1922. The main canal and a portion of the distribution system having been finished in July, the contractors were required to make provision for diverting water for irrigating approximately 4,000 hectares of land planted to rice during the past season. With the release of P.228,000 required for the completion of this project in September, 1922, the work of completing the distribution system was immediately resumed. It is believed that this work can be finished in time to furnish water to the entire area of 10,000 hectares for the next rice crop and for the official opening of the system by the end of 1923.

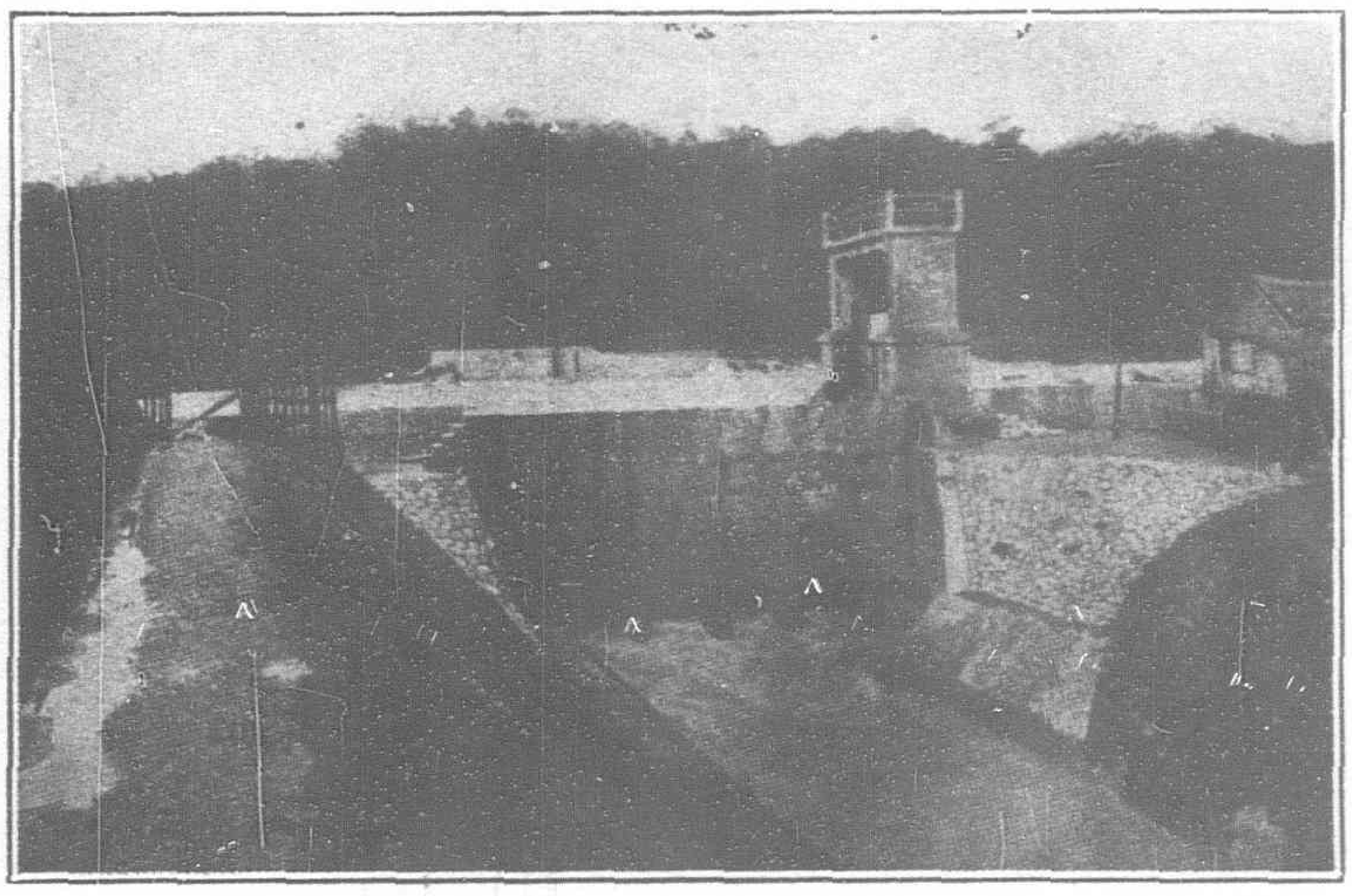

Chute at 15-metre fall, main canal, Talavera River Irrigation System, sight of proposed power plant, Nueva Ecija, P.I.

Tagudin Irrigation Project.—The work of driving the 1,300-metre diversion tunnel was resumed by administration with the release of funds in May, 1922, all construction work on this project having been shut down in August, 1921, because of lack of funds. Delays on account of the necessity for lining sections of the completed tunnel and from handling the large amount of water encountered during the rainy season interfered with the work of driving the tunnel. Very satisfactory progress was made, however, after the rainy season and it is now planned to complete the project as a whole during the 1924 dry season. A total of 670 lineal metres of the tunnel had been driven at the end of the year, of which 270 metres were driven and 126 metres lined during 1922. The headworks structure is also about 80 per cent. complete.

Amburayan River Irrigation Project.—Construction work on this project, which had been delayed from August, 1921, due to lack of funds, was resumed by administration with the release of additional funds in April, 1922. The work accomplished during the year included the driving of 390 lineal metres of the 750 metre diversion tunnel, excavating 48,000 cubic metres of material from a 5- to 7-metre cut on the main canal, placing 392.5 cubic metres of rubble masonry and concrete in main canal structures and laying 6,450 square metres of rubble paving in the main canal. The work of driving the tunnel is progressing very satisfactorily and should be completed during the present dry season. The main canal including the paving work and the construction of the distribution system will require at least another dry season for completion.

Angat River Irrigation Project.—The Atlantic, Gulf and Pacific Co., of Manila, contractors for the excavation of the south side canal system made very satisfactory progress during 1922 and it is thought that this work will be completed approximately on contract time or, in any case, during the present dry season. Three drag-line excavators and two large derricks have been used in excavating the main canal and a large force of labor employed on the smaller canals. The work remaining to be finished at the end of the year was largely confined to the first kilometre of the main canal which is in deep cut, involving considerable road work.

The contract for the construction of the diversion works was



Diversion Works, Talavera River Irrigation System, Nueva Ecija, P.I.

awarded to Mr. J. B. Findley, of Manila in April, but the early rains, which started in May and a late rainy season, prevented the contractor from accomplishing any work on the diversion weir proper other than excavating material above the normal water level. Considerable work, however, was performed on the construction of both the north and south side headgates and scouring sluices, which were successfully protected from floods. The delay in getting work started on the diversion weir means that the contractor is probably limited to one short dry season for completing the contract or will have to take the risk of holding uncompleted work in a large river during the rainy season, since the contract time expires the latter part of August, 1923. The work remaining to be finished involves the pouring of approximately 20,000 cubic metres of concrete and a large amount of wet excavation.

The preparation of plans of canal structures for the south side system was practically completed at the end of the year and additional funds were requested with a view to starting construction work early in 1923. It will probably require from one to one and a-half years to complete all canal structures for the south side system, which serves 15,000 hectares, but it is expected that water can be furnished to a portion of the land for the 1923 rice crop. Present plans contemplate starting the construction of the north side system in 1924 and completing the project as a whole in 1925.

Lamao Experiment Station Irrigation Project.—The construction of this project was discontinued in August, 1921, and P.25,000 of the P.30,000 appropriation reverted by the emergency board to the insular treasury. This being a special project for the bureau of agriculture, bond issue funds have not been provided for completing same. It is proposed to resume construction work as soon as additional funds can be made available.

Laoag-Vintar Irrigation Project.—This project was approved for construction in 1921 but it was necessary to delay construction work until bond issue funds were released in September, 1922. Bids for canal excavation work were opened in December, 1922, and a contract was awarded for this work to Mr. Sotero Baluyot, of Pampanga, at very satisfactory prices. The contract provides that this work shall be completed by June 1, 1924. Funds have been requested for starting the construction of the diversion works and it is expected to complete this project in 1924.

Operation and Maintenance

The following tabe gives the area irrigated and the financial status of insular irrigation systems operated and maintained by the division :—

Name of System	Province	Cost	Irrigable area *Hectares*	Area irrigated, 1922 *Hectares*	Cost of operation and maintenance, 1922	Total water charges, 1922	Remarks
Pilar	Bataan ...	P25,000	200.00	176.72	P1,616.54	P3,071.45	Completed in 1912.
San Miguel	Tarlac ...	1,089,000	4,000.00	2,248.00	12,527.67	15,241.00	Completed in 1913.
Santa Barbara	Iloilo ...	692,000	4,985.82	4,985.82	*786.53	†3,774.26	System officially opened December 1, 1922.
	Total ...	1,806,000	9,185.82	7,410.54	14,930.74	22,086.71	

*Cost for December, 1922.

†Charges for December only.

The San Miguel irrigation system is operated and maintained by the government in accordance with the terms of contracts with the *Compania General de Tabacos de Filipinas*, the owner of all the land served by the system, while the Pilar and Santa Barbara systems were operated and maintained under the provisions of the irrigation act.

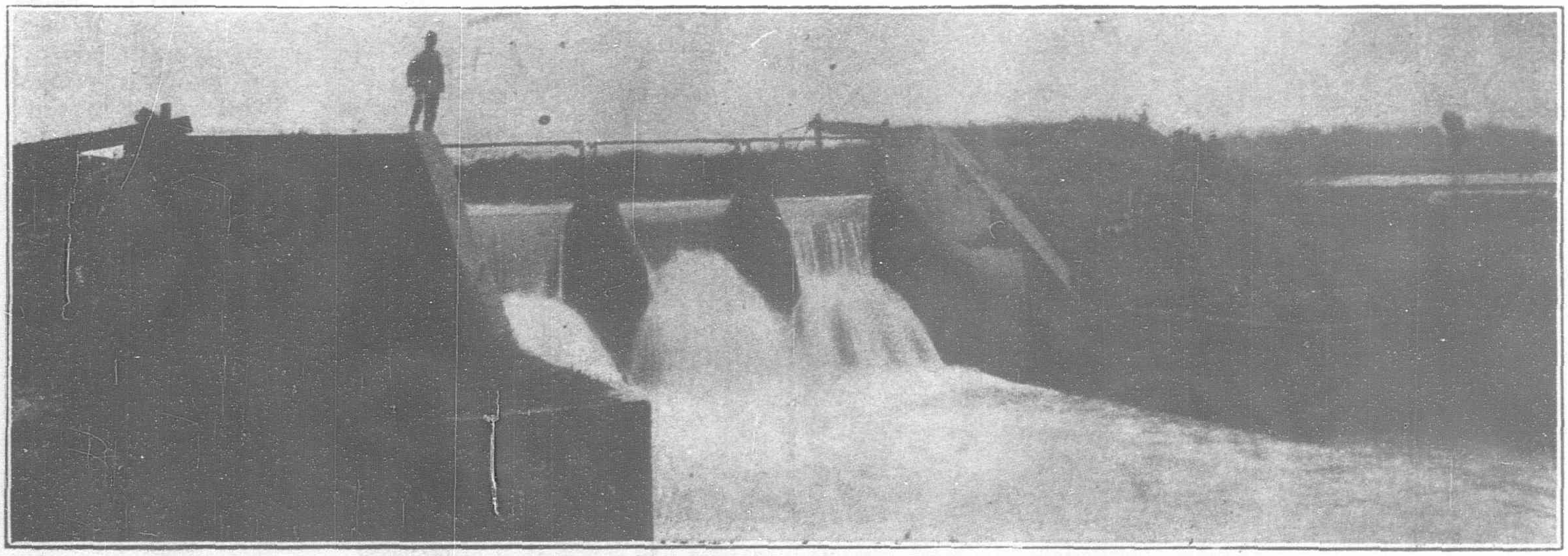
Considerable maintenance and repair work was also performed on the following Friar lands irrigation systems which are administered by the bureau of lands :—

Name			Estate	Province
Legidero system	...	...	Santa Cruz de Malabon	Cavite
Matanda system	...	...	do.	do.
San Cristobal system	...	...	Calamba Estate	...Laguna

Municipal Irrigation Projects

The following table gives the status of all municipal irrigation projects which have approved for construction under the provisions of Act 2755 :—

Project	Province	Irrigable area *Hectares*	Cost Insular	Municipal	Remarks
Santa Maria	Zamboanga	431	P16,000	P7,000	Completed 1920.
Ayala	do.	183	11,500	5,500	Completed 1922.
Dipolog	do.	1,000	37,500	14,000	50 per cent. completed
Total	... ...	1,614	65,000	26,500	



Standard type of Notched Full, Main Canal, Talavera River Irrigation System, P.I.

The Santa Maria and Ayala systems, upon completion, were turned over to the municipality of Zamboanga for administration as provided for in Act 2755. Construction work on the Dipolog project was discontinued by the district engineer in June, 1921, due to lack of funds and no work was accomplished during 1922 on account of the inability of the municipality of Dipolog to provide funds for financing the completion of the work. Upon the request of the municipal council of Dipolog and the provincial board of Zamboanga province, this project was approved for completion as an insular project, under the provision of Act 2152, in December, 1922. Irrigation notices are being served on the interested landowners and if no protests are received, construction work can be resumed in May, 1923. The revised estimate of cost is P.115,000.

Irrigation Projects under Consideration

The following list gives the location, irrigable area, and status of important irrigation projects under consideration :—

Province	Project	Irrigable area *Ha*	Status
Albay	Quinale Lake Bato	6,000	Awaiting investigation.
,,	Malinao-Tabaco	600	,,
Camarines Norte	Daet	2,000	Topographic survey completed.
,,	Talisay-Indan	3,000	,,
Camarines Sur	San Jose-Hagonoy	5,000	Awaiting investigation.
,,	Pauili Valley	5,000	Topographic survey completed.
,,	Barit River	2,000	Awaiting investigation.
Antique	Sibalom	3,800	Topographic survey completed.
Bataan	Dinalupijan	2,500	Awaiting investigation.
,,	Orion	1,270	Topographic survey completed.
Capiz	Maayon	2,000	Awaiting *investigation.*
,,	Mambusao	1,000	Preliminary investigation 1911.
,,	Macato-Malinao	1,200	,,
,,	Ibahay	500	,,
Cavite	Maragondon	1,400	Topographic survey completed.
Ilocos Norte	San Nicolas	4,000	Preliminary investigation 1910.
Ilocos Sur	Abra River	10,000	Preliminary survey completed 1909.
,,	Candon	3,000	Topographic survey completed.
,,	Santa Cruz	1,000	Preliminary survey completed.
Batangas	Batangas	1,000	Investigation in progress.
,,	Balayan	300	,,
,,	San Juan de Bocboc	1,000	Awaiting investigation.
Iloilo	Jalaur River	18,500	Topographic survey completed.
,,	Pototan	2,300	Survey and preliminary design made.
,,	Cordova	2,000	Topographic survey completed.
Isabela	Magat River	40,000	Awaiting investigation.
Laguna	Santa Cruz River	5,000	Topographic survey completed.
La Union	Balaoan	1,200	Survey and plans completed.
,,	Bacnotan	2,000	Topographic survey completed.
La Union	Agoo-Tubao	2,000	Awaiting investigation.
,,	Naguilian	1,000	Preliminary survey completed.
,,	Rosario	1,000	Topographic survey completed.
,,	San Juan	1,000	Awaiting investigation.
Leyte	Barugo	1,000	Topographic survey completed.
,,	Dagami - Tanauan	*14,000*	*Awaiting investigation.*
,,	Dato-Hilongos	3,500	,,
Nueva Ecija	Pampanga River	25,000	Topographic survey practically completed.
,,	Peñaranda	17,500	Topographic survey completed.
Nueva Vizcaya	Murong	1,200	,,
Occidental Negros	Binalbagan-Himamaylan	3,000	,,
,,	Bago	20,000	Topographic survey in progress.
,,	Silay Projection	5,000	Anwaiting investigation.
Oriental Negros	La Granja Exporting Station	200	Investigation in progerss.
,,	Tanjay	800	Awaiting investigation.
,,	Tolong	3,000	Preliminary investigation completed.
Pampanga	Porac River	1,000	Topographic survey completed.
,,	Bamban	3,000	,,
,,	Gumain	5,000	,,
Pangasinan	Agno	30,000	Topographic survey in progress.
,,	Mangatarem River	2,000	Recommended for construction, Act 2755.
,,	San Fabian	4,000	Recommended for construction, Act 2755.
Rizal	Mariquina Valley	5,000	Topographic survey completed.
,,	Pililla	180	Recommended for construction, Act 2755.
,,	Morong	580	Recommended for construction, Act 2755.
Tarlac	*Capas*	*5,000*	*Topographic survey completed.*
,,	Tarlac	30,000	Awaiting investigation.
Zambales	San Marcelino	5,000	Topographic survey completed,
,,	Toton-Lanom	600	,,
,,	Iba	400	,,
	Total	319,530	

Topographic surveys were completed during 1922 of the Candon project, in Ilocos Sur, and the Santa Cruz River project, in Laguna, covering a total area of over 10,000 hectares. Survey work was also practically completed for the Pampanga River project in Nueva Ecija, which embraces an area of about 30,000 hectares. This makes 31 projects, which have been surveyed and are ready for construction as soon as funds can be made available. These projects would irrigate a total area of over 160,000 hectares, while projects under, or awaiting, investigation would benefit an additional estimated area of 160,000 hectares. Investigations were in progress at the end of the year, with survey parties in the field, on the Bago River project, Occidental Negros; Naguilian River project, La Union ; Agno River project, Pangasinan and Pampanga River project, Nueva Ecija.

Five-Year Program for the Construction of Irrigation Projects

In addition to insular irrigation projects now under construction, the following projects have been tentatively included in the program for the construction of irrigation projects from the twenty million pesos appropriation authorized by Act. 3011 :

Project	Province	Irrigable area	Estimated cost	Remarks
Murong	Nueva Vizcaya	1,500	P130,000	
Sibalom	Antique	3,800	500,000	Construction recommended in 1922.
Santo Tomas River	Zambales	4,000	450,000	
Capas (San Miguel Extension)	Tarlac	4,500	285,000	Construction recommended in 1922.
Peñaranda River	Nueva Ecija and Bulacan	17,500	2,300,000	,,
Barugo	Leyte	1,000	200,000	
Agno River	Pangasinan	30,000	5,000,000	
Pampanga River	Nueva Ecija	25,000	3,000,000	
Pañgiplan River	Occidental Negros	3,000	400,000	
Bacnotan	La Union	2,000	200,000	
Santa Cruz River	Laguna	5,000	650,000	
Daet-Talisay	Camarines Norte	4,000	500,000	
Total		101,300	13,615,000	

At three places in the principal island of New Zealing, hydro-electric developments are under way. They are: Arapuni Rapids, 96,000 horsepower; Lake Waikaremoana, 40,004 horsepower; and Mangahao, 24,000 horsepower. With other smalles stations they will be joined in a huge triangle, 1100 miles of electric current transmission, at 110,000 volts, to supply electric service to every section.

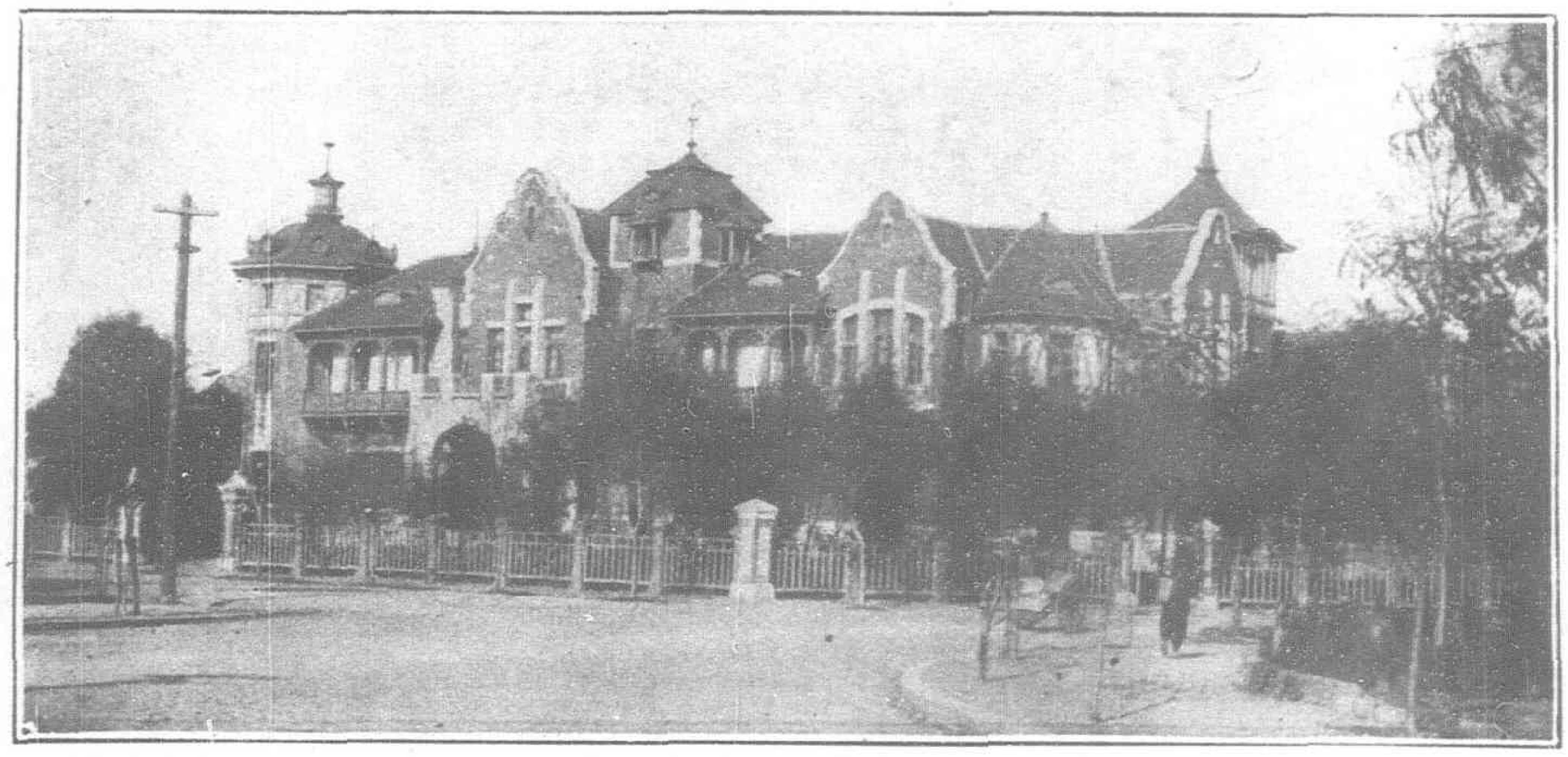
A large lake in the interior of Tasmania, off the coast of Australia, 3000 feet above the sea, will furnish water power for a hydro-electric plant at Waddamanna, from which two cities, Launceston at the northern extremity and Hobart at the southern are supplied.

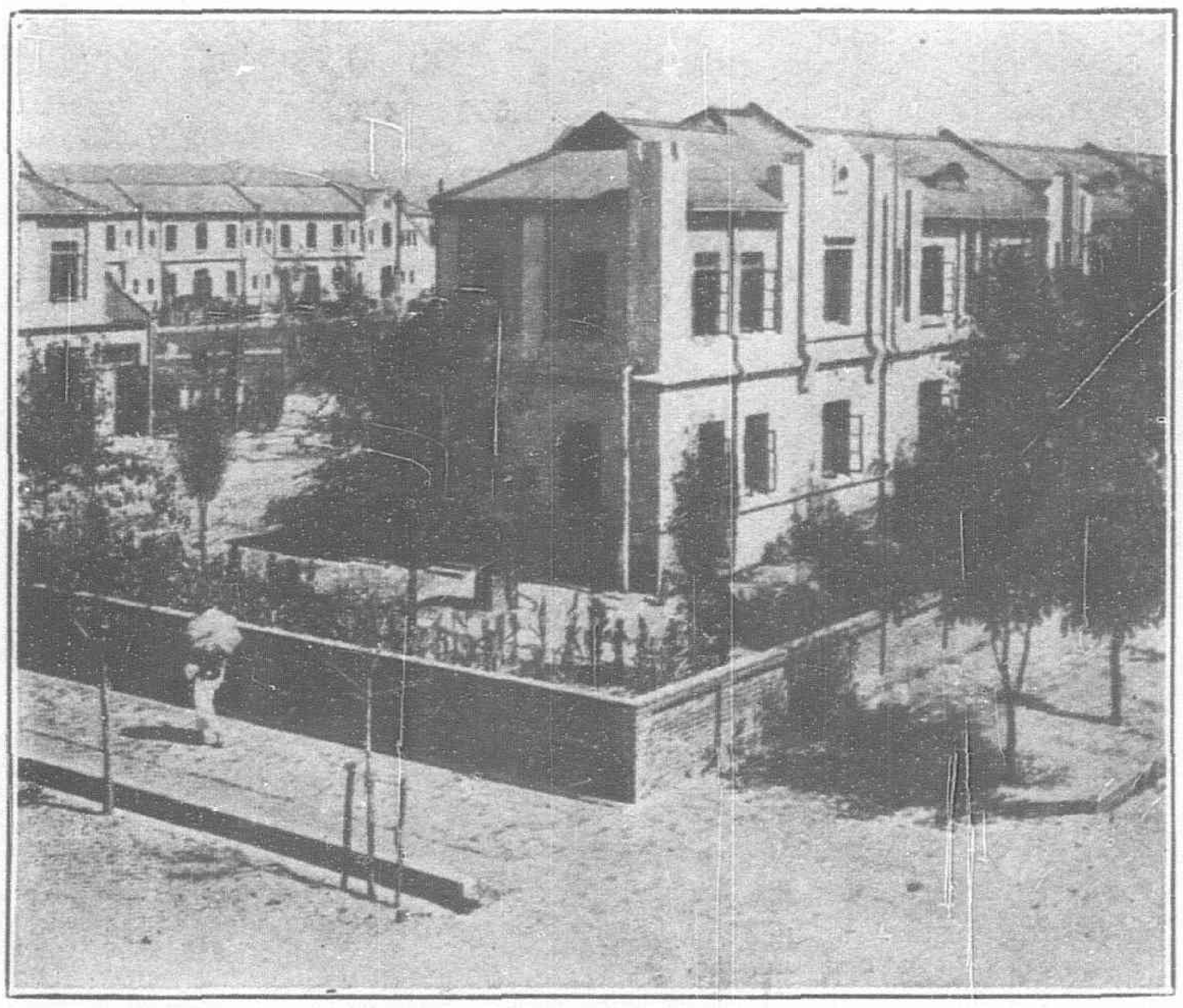
Artificial lakes in the high mountains of western India impound water from which comes the energy that, flowing through mountain tunnels, is made to prive waterwheels which transform the force the water into electric cusrent. The latter is sent from 40 to 60 miles to Bombay, India's industrial seaport.

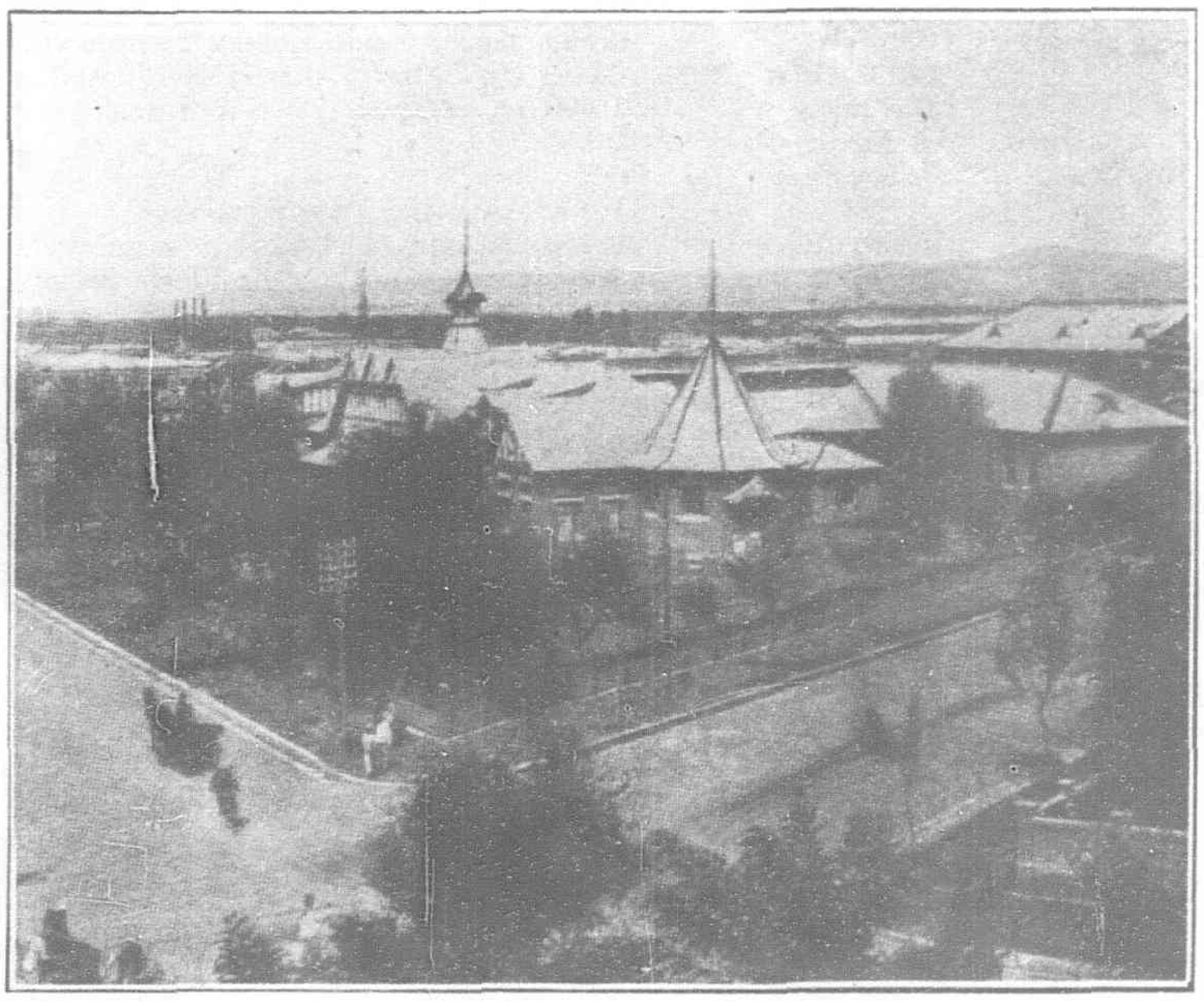
New Colliery Town of Fushun

OUR readers, says the *Manchuria Daily News*, will recollect how the S.M.R. Co. bought up the privately-owned buildings in the railway town of Fushun, leaving the purchase of those in the quarter commonly known as Shinmachi adjoining the colliery town still open for a future settlement. As regards the construction of a new town at Yungantai to take the place of the existing colliery town, an announcement on the subject was made by Mr. M. Umeno (general manager of the Fushun Collieries and also of the Anshan Iron and Steel Works), on October 13, to the following effect :

The heights in the proposed site comprising 260,000 *tsubo*, are set apart for the residential quarter, and 300,000 *tsubo* on the lower level, for the business quarter. 180,000 *tsubo* in total area on the east and west of the town site is for two parks ; and for the railway station, a tract of 80,000 *tsubo* is appropriated. The area on the north side of the station is reserved for the produce dealers. The capacity for the business quarter is put at 5,000 people, and that for the residential quarter at between 8,000 and 10,000. The capacities mentioned may be comfortably exceeded. A good sized area is reserved adjacently to the business quarter to which Chinese businessmen are cordially welcomed. The colliery office, with schools, hospitals, market place, library, clubs, etc., will be located south of the business quarter, and adjoin the residential quarter on the east. Temples and churches will be situated on the slopes between the heights and the business district. The sites for the colliery shrine and the restaurant quarter remain indeterminate. The war memorial, a cemetery, a swimming pool, a recreation ground, etc., will be located in the park ground or the green zones. In order to protect the town from possible inundation, a strong embankment is to be constructed in the shape of the capital letter " L " down to near the bank of the Yangpaipu River. The street in front of the railway station will be lined with S.M.R. Co. office buildings on both sides. The electric tramway will encircle the town, connecting with the present colliery town, which, on the prospective removal of the town, will be known as Chienchinchai. Any part of the new town will thereby be made accessible on foot in ten minutes at the most. For the construction of the embankment, that will comprise something like 330,000 cubic *tsubo* (1 cubic *tsubo* being 36 cubic feet), will be built of the earth to be obtained by extending the open cut mining system to the existing colliery town. For a sewage system, the pumping appliance will be installed after the example of Antung, to provide against a possible deluge of the Hun River, in which event the ordinary drainage equipment will be found wanting. One novel feature of the town planning is that all lavatories will be of the flushing system. As to gas service, it may be made available from next year. The average dwelling area is placed at 60 or 70 *tsubo* per house for rent. When the new town gets ready for residence and occupancy, it will be perhaps the most picturesque in all Manchuria.


Colliery Club


Homes of Skilled Laborers


Elementary School

TYPES OF BUILDINGS IN THE COLLIERY TOWN OF FUSHUN

The removal of the colliery office, government and other principal establishments, would have to keep pace with the progress of the open cut mining. Otherwise, capital would be needlessly fixed. What shape the future open cut mining will assume still lies under study.

At present the plan has been drafted to extend over 20 years, but the time may be cut down to 15 years or so, far a good deal depends on what progress may be accomplished by the underground mining. At all events, for 30 years hence the Fushun Collieries will maintain the highest tension of activity.

Two Plans for Future Open-Cut-Mining

The future open-cut-mining plan on an extensive scale involves divers engineering and other activities. There are two plans to be laid before the S.M.R. Co. Directorate, one by Mr. T. Onuma, superintendent, the Kuchengtzu Mining Office, Fushun, to whom the credit of conceiving the plan of working the enormous coal-field of Fushun by open cut is due, and the other by Mr. L. D. Davenport, the American mining engineer, who was a member of the American specialists' party that visited Fushun in the summer of 1921, assisted by Mr. G. W. Batailson. The latter plan had been completed by the 15th inst. and Mr. Batilson has started on a fortnight's tour of Peking and Tientsin. The former plan, too, is expected to be ready before the end of this month.

Equipment and Operation of the Port of Sabang

Paper Read Before the Engineering Congress at Batavia by G. C. Quarles

Equipment of the Port

FIRST of all the difference has to be taken into account between the requirements for a port of ultimate destination with large imports and exports, where in a general way steamers complete discharge, and the accommodation required for a port of call mainly designed for the supply of bunkers and stores and for the transhipment of goods.

Port of Sabang

For an equal amount of tonnage, more length of quay will be required in a port of ultimate destination than in a bunkering and transhipment port, because in a general way the berth will be longer occupied by the steamer in the former case than in the latter one.

In the former case namely the steamer has to be fully disscharged, her holds will have to be cleaned, eventual repair effectuated and the sailing date fixed with the necessary latitude.

In a transhipment port the quantity of cargo handled will be less in comparison to the tonnage of the steamer than in a port of ultimate destination.

Therefore *quick despatch* is the principal thing required for a transhipment port and specially for the discharge of coal cargoes and the bunkering of steamers.

The following example speaks for itself :—

A 10,000 tons steamer which is being runned at a daily cost of say £80 and has to replenish her bunkers with 200 tons, if detained 12 hours for entering the port, berthing, coaling and unmooring, will incur an additional expense in consequence of detention of $\frac{800}{200}$s, viz, 4s. per ton in addition to the price of the coal.

On the other hand if a coaling station can guarantee bunkering at the rate of 100 tons an hour and say one additional hour for berthing and unmooring it will for steamers loading cargo on their deadweight certainly pay to load 200 tons more cargo at loading port and call for this quantity of bunkers at an intermediate coaling station. For a 10,000 tons steamer as above mentioned three hours detention will only mean an expense of £10 or 1/- per ton of coal bunkered.

At the port of discharge in a general way no such quick despatch for bunkering will be needed, as there will be ample time for same during discharge and loading of cargo.

The port of Sabang has systematically been built and equipped according to the above mentioned principle of maximum despatch for the handling of goods and coals with a minimum length of quay in order to keep expenses as low as possible.

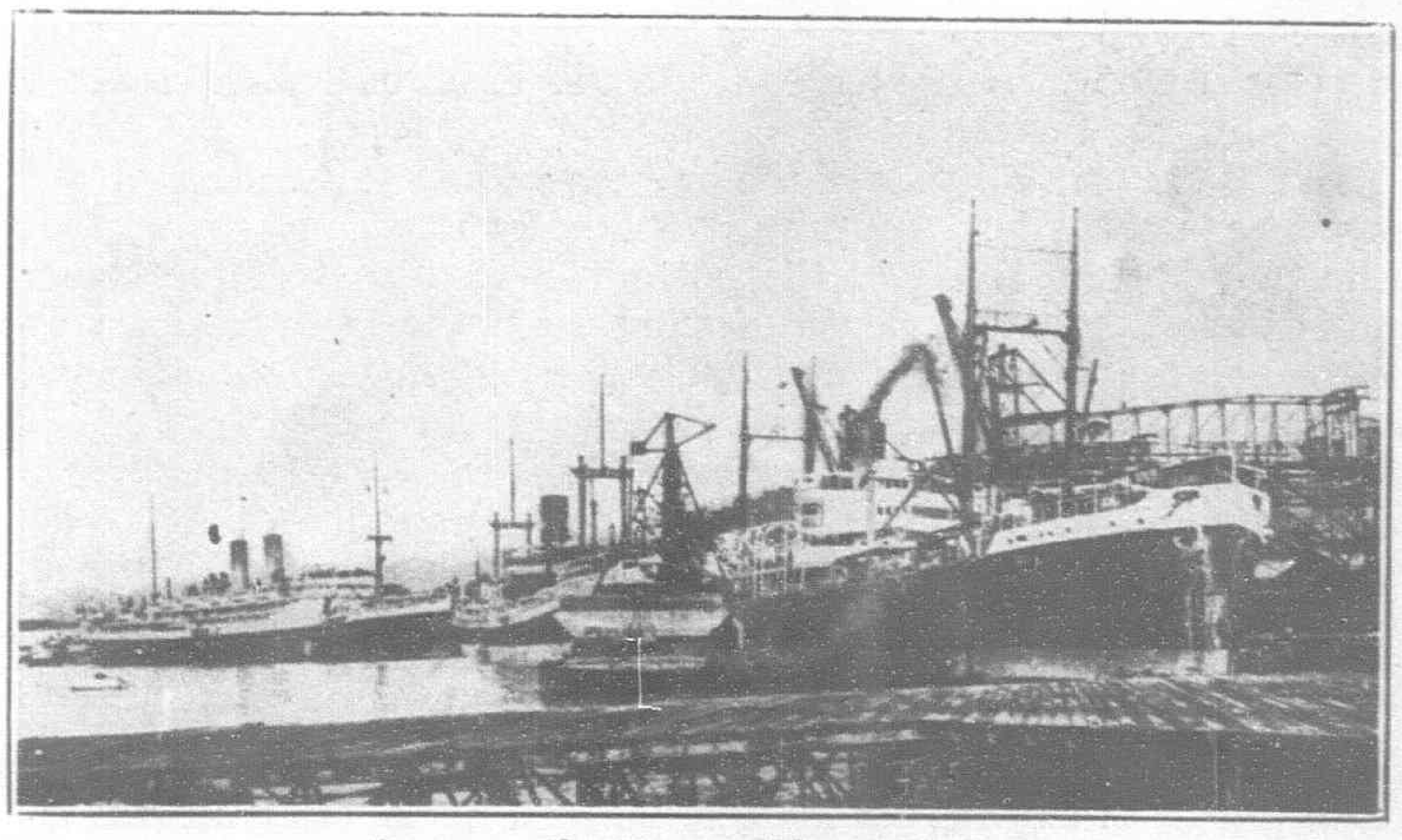
For this purpose the quays are equipped with five huge electrically driven transporters, by which iron buckets containing about 40 cwts. of coal are lifted and carried by travelers above the sheds and lowered through hatches in the roofs of same.

For bunkering the same movements are executed in an opposite direction, using in this case, however, either buckets or baskets.

Besides these transporters a powerful bunkering barge of 200 tons capacity per hour working with two shutes and another barge working with grabbuckets containing 7½ tons, used both for discharge and for bunkering, enable steamers to be discharged and bunkered day and night with the utmost despatch.

The use of these mechanical appliances has shortened the time necessary for discharging coal-cargoes to 1/6 and for bunkering to half of the time required for these manipulations when effectuated by hand labor, thus enabling to reduce the length of quay to only one-third of that, which would have been required without the above appliances.

Admitting that in a well equipped port an average of 500 tons of *general cargo* is being handled per yard quay frontage in a year, at Sabang the quantity of *coals* which can be discharged and loaded by steamers of an average length of 400-ft. would read the respectable quantity of 7,000 tons per yard if steamers followed each other up in berth regularly.



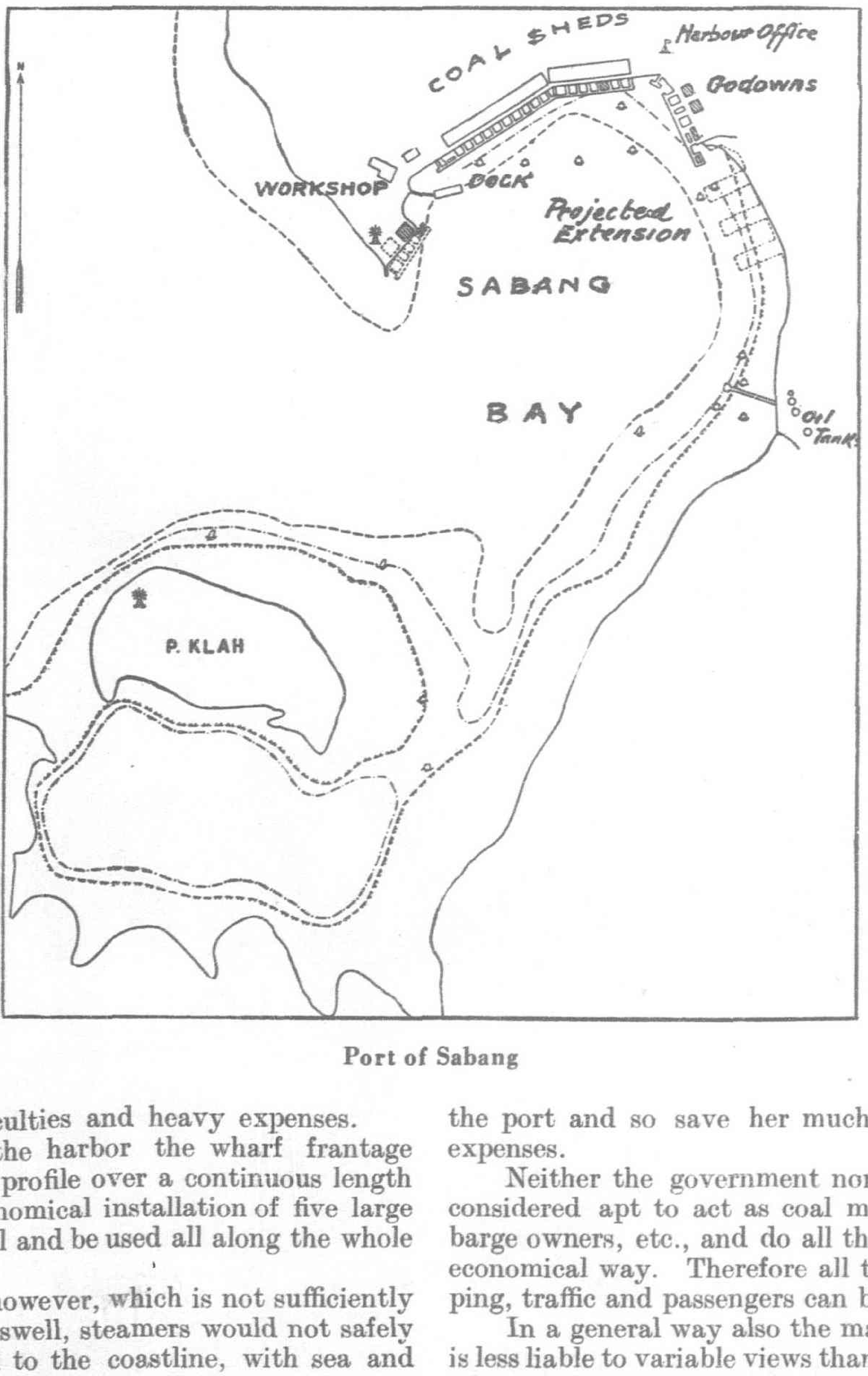
Steamers Coaling at Sabang Harbor

Though, to be sure, this theoretical quantity is not by far being recorded in practice, in fact it may be admitted that at Sabang a maximum efficiency is being obtained out of a minimum length of quay.

With regard to the fittest system for berthing steamers the following items were taken into account when making a choice between concrete quays or iron wharves and between moles or jetties, or quays (eventually wharves) parallel to the coast.

At the time of building the harbor the construction of iron wharves in a depth of water of 30-ft. involved an expenditure of about £75 per yard against an estimate of £375 per yard for a quay of concrete or stone.

Allowing 5 per cent. for maintenance and depreciation and taking into account 5 per cent. interest on the invested capital, the iron pier will only cost £7 10s. per yard per annum, whereas the mere interest on the capital in the case of a quay of concrete or stone without making any allowance for maintenance and depreciation will already amount to £18 15s.



Port of Sabang

With respect to the choice between jetties and wharves parallel to the coastline the following circumstances had to be taken into account:—

In the northern part of the bay, which (see annexed map) is entirely sheltered against wind and sea throughout the year, the bulider of the port was free in his choice to fix the direction of the quay frontage. Therefore in this part of the bay, where the coastline gradually bends in the form of half a circle, the front of the quay could about follow this direction.

Jetties in that part of the port were not only not required but even most undesirable

(1) because owing to the steepness of the coast and the nature of the bottom consisting of coral, sand and stones, the building of jetties of a suitable length of about 400-ft. with basins of 35-ft. depth between them, which would partly have to be digged into the coast would have met with many difficulties and heavy expenses.

(2) because in this part of the harbor the wharf frantage could easily be made of the same profile over a continuous length of 2,000-ft., thus allowing the economical installation of five large transporter cranes which can travel and be used all along the whole length of the wharf.

At the east coastof the bay, however, which is not sufficiently protected against the sea and the swell, steamers would not safely lie moored alongside piers parallel to the coastline, with sea and swell athwart of same.

Therefore in that part of the bay the system to be adopted will have to consist of jetties athwart of the coast. It, moreover, happens that the condition of the bottom in that part of the coast, consisting of sand to a depth of more than 8 fathoms, is most fit for the building of the projected moles. The heads of same, schemed in 40-ft. depth of water at low springtide, do not emerge outside of the frontage of the adjacent wharves and the construction there will not meet with difficulties. The concrete walls of the moles having only to be filled up with the sand taken from the basins between them digged and dredged at the required depth of 40-ft.

Operation and Management

Taking for granted that: (1) the equipment, operation and management of any harbor have to be such as to meet all reasonable requirements of shipping, trade and passengers with regard specially to quick despatch and cheapness; (2) the expenses for same ought not to be borne by the tax-payer but exclusively by the parties interested; (3) there must be unity and continuity with regard to the management. The first thing to be considered is the question whether the management and operation ought to be in the hands of the government (or an official harbor board) or in those of a private limited company.

The advantages of operation by the government are: that one may practically be sure, that the costs for shipping and trade will not be increased by endeavors to unduly augment profits, that the necessary means for equipment and extension of the port will practically never fail, and further that for maintaining order and regulating shipping and traffic in the harbor, the manager will have the required authority.

On the other hand the management and operation of the port by a financially strong private company will have the great advantage, that any extension of harbor works or equipment can be extended immediately when required, without having to wait for a decision of several government authorities or for the vote of parliament which will in a general way be required to obtain the necessary funds. With government management it is only after having secured the government sanction that contracts for the execution of the works can be closed, which again means a great loss of time.

It further speaks for itself that a private company are less bound to formalities and will work easier with regard to giving trade all possible facilities.

It is also most important for shipping, that the supply of coals and water, the effectuation of repairs, the handling of cargo, the working of mechanical appliances, the supply of tugs and craft, the pilotage, etc., *be in the same hands*, so that the manager can immediately arrange to meet all these requirements of a steamer calling at the port and so save her much time and a lot of trouble and expenses.

Neither the government nor any other official board can be considered apt to act as coal merchants, ship repairers, tug and barge owners, etc., and do all these business in a commercial and economical way. Therefore all the different requirements of shipping, traffic and passengers can be best met by a limited company.

In a general way also the management in hands of a company is less liable to variable views than when in hands of the government whose views change with those of successive officials, directors, governor-generals and ministers and which are subject also to the approbation or rejection of parliament.

At Sabang, since 1909, owing to a contract, which the government of Netherlands India closed with the *Sabang Bay Harbor & Coal Co., Ld.* the way of operating the port combines the advantages of both systems.

According to the said contract the government got the property of all the actual harbor works, but at the same time leaesd same to the Company for a period of fifty years.

The lease-holder takes care of the extension and improvement of the harbor works, which he deems to be in the interest of shipping and trade. The government takes over these works after completion and again lease same to the Company. If, however, the

(*Continued on page 19*)

Tin, the Cornerstone of Malaya

By Kilmer O. Moe

ANY one passing through the Federated Malay States by train or motor will not fail to notice that every stream runs thick with mud as if a thunder storm had just passed over even though the sky be clear and the sun be shining ever so brightly. This blot on nature is further intensified when the tin mines come into view.

The entire countryside is fearfully mutilated. Deep gashes and ugly wounds mar the face of nature beyond the point of recognition. Scarred and pitted with open cast mines or abandoned pits filled with muddy water, the countryside with its mounds of overburden piled everywhere, and every which way, looks for all the world as if the face of nature had been disfigured by an ugly disease which permanently mars an otherwise beautiful countenance.

Tin mining is not what you would call an industry that appeals to the artistic temperament. You just have to close your eyes to its ugly features and concentrate on its economic benefits. Think of the infinite number of ways in which this lowly metal lends itself to the service of mankind. Scarcely a household in all the world but what has experienced some use or other of tin made up in the form of containers or of utensils. From the farthest point in the frozen north to the middle of the Sahara desert, and south to the ice-bound regions of the other pole, life has been made more acceptable to all mankind because the products of all climes have been shipped in tin containers. This metal more than any other has helped to bring mankind closer together.

That is the great idea underlying the world demand for tin—*Service to Mankind*. Petroleum and gasoline, fruits and vegetables, household utensils; and toys for children, food products and commodities, in an infinite number of useful purposes come packed in tin, or are made of this useful metal. Therefore, we may well overlook this defacement oi the countryside and be truly thankful that here is a place where the metal is found in sufficient quantities to supply the world's demand. When viewed in the light of the service that is being performed the seamed and pitted countryside takes on a new meaning. Looked at from this angle the homely furrows are not defacements but the rugged features of the battle scarred hero.

The countryside is scarred beyond hopes of reclaiming by abandoned tin mines

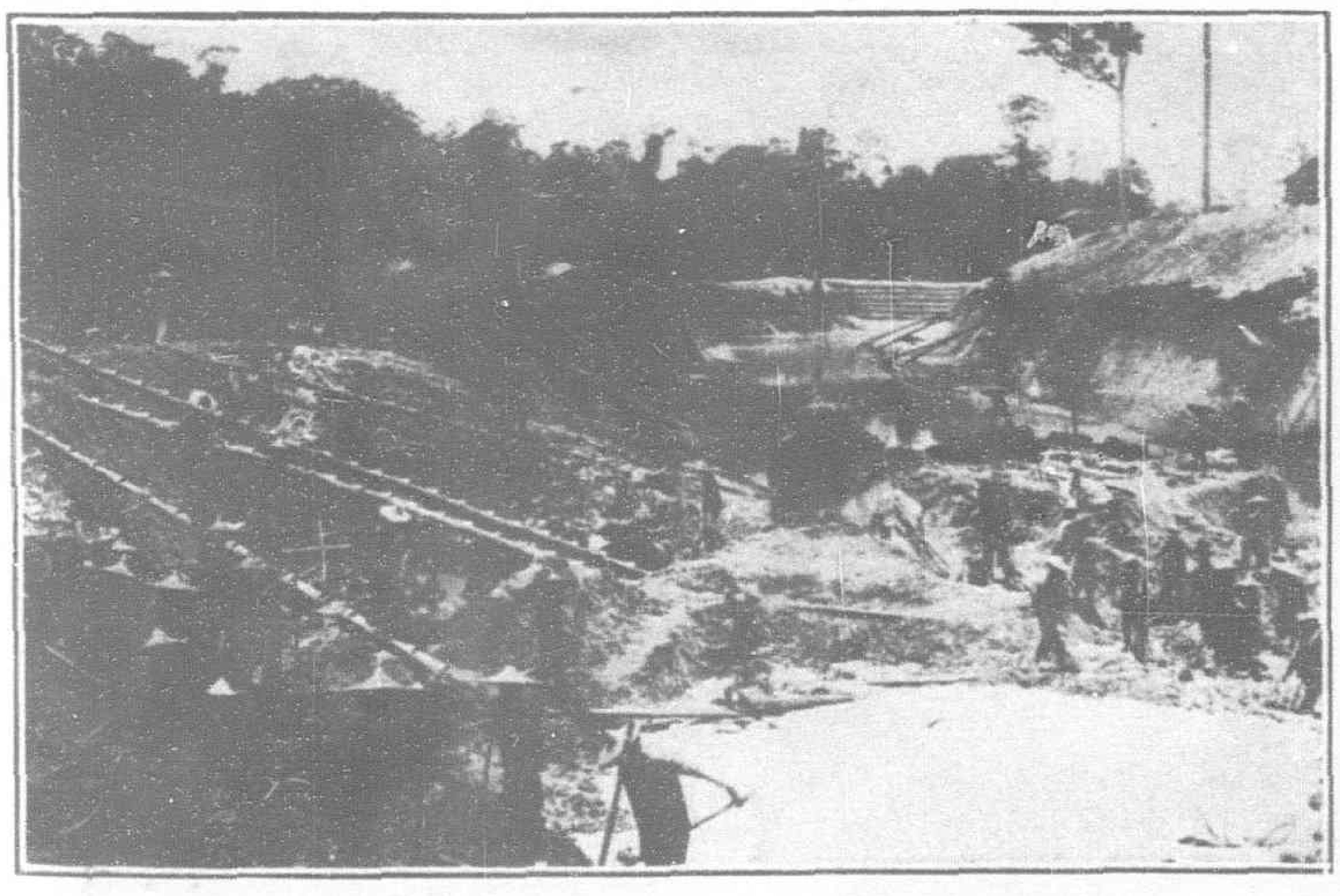
Roughly speaking forty per cent. of the world's supply of tin comes from the Federated Malay States. How is that for service? Here is an area of a little more than twenty-five thousand square miles of territory, two-thirds of which is unexplored and unworked, yet there is taken from the ground in one year ore worth twelve million pounds sterling. The government collects an export duty on all this wealth and it is this revenue which has made the country the rich land it is now, and will yet make it richer. Tin, therefore, is the cornerstone of the wonderful economic structure that has been built up in Malaya.

Tin brought prosperity into Malaya even before the romance of rubber excited the money centres of the world. Rubber has never been the main source of revenue for the Federated Malay States and cost the government far more than tin in roads and railroads, permanent assets though they be.

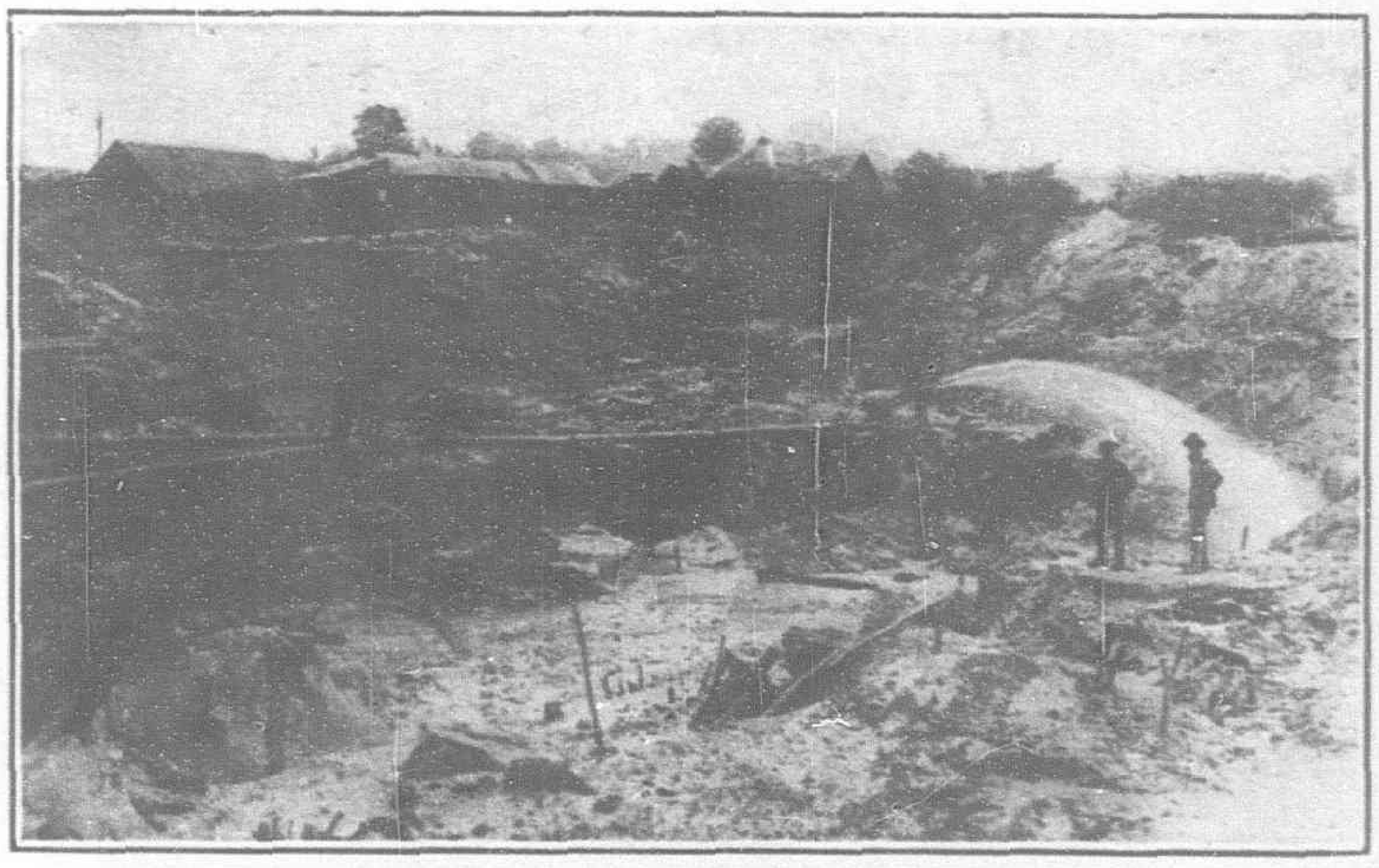
Chinese voyagers speak of tin being mined in the Malay peninsula at the beginning of the fifteenth century. D'Albuquerque, the Portuguese colonizer, found a tin coinage current in Malacca when he conquered that old world settlement in 1511. In the middle of the nineteenth century the discovery by Chinese of rich bearing tin fields in Perak led to factional fights among the Chinese miners and to British intervention in the affairs of the Federated Malay States. By 1914 the production of tin in the country had reached forty per cent. of the world's total supply. In the year 1921 the records show that two-sevenths of the tin mined went to the United Kingdom while more than three-sevenths found its way into the United States.

The Siamese undoubtedly did a good deal of mining years ago as testified to by the old workings under ground. The Malays themselves, natives of the country, did little and that probably unwillingly. To the Chinese is due the honor of opening up this industry. They came by tens under Malay rule but by thousands under British domination. They were the pioneers who proved the richness of

(*Continued on page 38.*)



Chinese coolies at work in an open cast mine in Malaya



The monitor at work tearing out the tin-bearing ore under water pressure

New General Hospital of S.M.R. Co.

Building Lessons from the Tokyo Disaster

By S.M.R. Intelligence Bureau

The Fuller Kenchiku Kabushiki Kaisha (Messrs. Geo. A. Fuller Co. of the Orient, Ltd.) who constructed the Marunouchi Building in Tokyo, have entered into a contract on a commission system with the South Manchuria Railway Company to build the new General Hospital buildings on their new site at the southeast of the Yamato Hotel, Dairen.

The total estimated cost running up to above Y.3,000,000, the award of the big contract to a foreign firm created no small stir among the Japanese builders at that time. They have naturally been following with very keen interest how the construction work has been progressing, to satisfy themselves above all as to the one question that has suggested itself to them. "Was it really worth while giving the contract to American builders?"

Then, like a bolt from the blue, the Tokyo district was visited with the worst earthquake in the annals of Japan. How the Marunouchi building has come out of it has been a focus of curiosity. For, upon this test the reputation of the great American firm has, in a sense, depended, at least to the Japanese mind.

In the indescribable confusion following the catastrophe,—earthquake and conflagration, with the loss of nearly 80,000 lives and property valued at about Y.4,000,000,000—reports were conflicting as to the damage sustained by the Marunouchi building from the seismic disturbance. The first report said it was made useless; another stated that only some of the masonry suffered; and then the truth was made known that only slight damage has been done that can be easily repaired, demonstrating that art, in this instance at least, has prevailed over nature even in her ugliest temper.

In order to bear out our vindication of the American architects concerned with the same edifice, we should be more explicit and an extract of the expert verdict on the matter, which follows, will quite suffice:

Structural Steel

The steel frame in every case seems to have been of sufficient strength to withstand the dead loads and the sudden application of any superimposed loads due to vibrations caused by the earthquake and also seems to have shown a sufficiently high elastic limit to have returned to its original position in every case. That there was undoubtedly a marked momentary deflection laterally in the columns is evidenced by the shattering of the masonry piers surrounding or enclosing the exterior wall columns, the plastered partitions between steel columns of the interior and the distortion or destruction of the steel cross bracings.

While the momentary and violent deflection of the columns laterally, particularly in the lower stories, was of sufficient strength to shatter those parts of the structure mentioned, the agitation was not sufficient to permanently distort the structural steel in any case.

Reinforced Concrete

There does not appear to be any marked or serious damage to the reenforced concrete floor slabs or beam coverings.

Where reenforced concrete walls were used on the interior there was a minimum amount of damage, except at certain points on stairway walls near the west side of the building. This damage was probably due to the lack of continuity of these walls in a straight line.

Masonry Piers

In practically all of the exterior masonry piers of the second, third, and fourth stories, there was evidence of a violent lateral motion or vibration of the entire structure; this extended in a slighter degree to the piers of the first story and the upper stories. Above the fourth story there is more or less destruction of exterior masonry, but not nearly so pronounced as in the lower stories.

There appears to be no particular kind of material outstanding as successfully resisting the crushing and, distorting effects of the lateral movement.

Hollow brick, common brick, cut stone, reenforced concrete backing, stucco, an tiles, all showed more or less instability. The relative value of these materials might be considered in an ascending scale in the order named.

Interior Partitions

The interior partitions in general are constructed of hollow clay tiles, metal lath on steel furring, concrete or reenforced concrete all plastered on both sides. The hollow tile seems utterly unable to withstand the effect of the lateral movement of columns, as evidenced by the crushing and falling of this class of partitions where the vibration was greatest or in the lower stories. In certain locations where metal lath partitions were used there was more or less damage, but this damage was not nearly so pronounced as in the hollow clay tile partitions.

The concrete partitions behaved in a little better manner, and the reinforced concrete partitions seemed to be the best of all, but there were some cases of a shattering of these by being forced out of line by the pressure of another wall at right angles.

Marble Trim and Wainscoting

A portion of the marble finish of walls and columns in the first story was dislodged and destroyed, but as this work was done in the usually accepted manner there can be no thought of faulty workmanship.

Two views of the New General Hospital Buildings of the S.M.R. Co. at Dairen as they appeared on October 2, 1923

In Conclusion

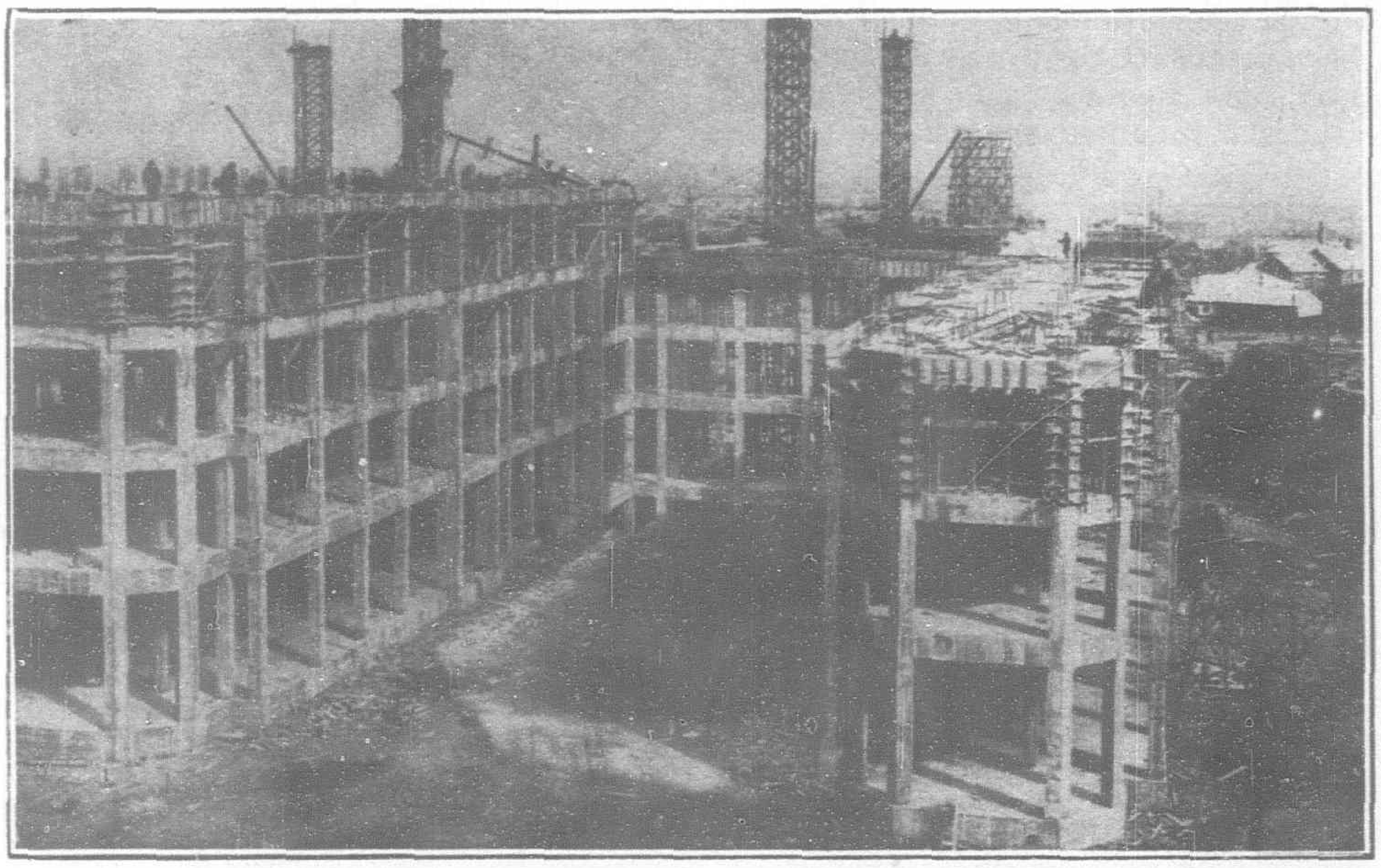
After the San Francisco earthquake of 1906, architects and contractors held many meetings to discuss various building materials and methods of construction with a view to adopting such as seemed to be the best suited for stability. Practically all of the reconstruction work in that locality was based on designs and materials similar to or the same as those used in Tokyo in recent years, and the Tokyo buildings constructed by the Geo. A. Fuller Co. would have withstood the shocks of an earthquake of the same degree of severity as the San Francisco earthquake, with a minimum amount of damage.

The Tokyo earthquake of 1923 was of such unprecedented severity and of such a tenacity of violence the world feel the necessity to readjust all their ideas of construction methods and to adopt such designs and take such precautions as in their belief will provide a greater measure of stability for future structures and a consequent added security for the lives of those occupying them.

Lesson Taught by Earthquake

We have reproduced at great length what damage has been done by the great earthquake to the Marunouchi bldg. (in which, by the way, the S.M.R. Co. Tokyo branch office rents a suite of rooms).

As found in the above observations, even the highest architectural authorities in Tokyo have failed to make adequate provisions for an earthquake shock of so violent a force. The recent catastrophe has served to them as an eye-opener, for they, too, have seen the necessity to "readjust their ideas of construction methods and to adopt such designs and take such precautions as are calculated to provide a greater measure of stability for future structures."



The right wing of the New Hospital as it appeared on November 1, 1923

Just what shape the recommendations of these authorities may take must be of profound interest, and we shall now proceed to give them in brief, item after item.

Foundations

A close observation of the effects of the recent earthquake in Tokyo induces the belief that all foundations should be of friction piles capped with reinforced concrete, isolated pier spread footings, or a solid concrete mat without piles.

In the case of friction piles a number of test piles should be driven of different lengths and in several locations on the lot, each pile tested as to its bearing capacity and each foundation computed from the data thus obtained, allowing a safety factor of six or seven. In no case should the piles be driven to hard pan or to refusal. Each cluster of piles should be capped with reinforced concrete and these caps connected at the top in each direction with reinforced concrete struts.

In the case of isolated pier spread footings load tests should be taken in several parts of the lot at the proposed level of the footings and the size of each footing computed from the data thus obtained, allowing a safety factor of at least five. These footings should be connected in each direction with reinorced concrete struts.

In computing the loads to be carried by either the pile-footings or the isolated pier spread footings, only the actual dead load of the structure should be used. No live load should be figured, or at the least only a very small percentage. Care should also be taken to have the bottoms of all footings at the same level, and deep basements should be avoided.

In the case of a solid concrete mat foundation the mat should be of sufficient thickness and figured for reinforcement to withstand the actual pressure on the ground as determined by computation of dead loads, and should project sufficiently beyond the outside columns to avoid eccentric loading.

The above recommendations are based on a belief that the soil underlying Tokyo will act as a sort of shock absorber, as evidenced by the behavior of such buildings as the Seiyukai building, the Imperial Hotel, and several other office buildings in Marunouchi, Tokyo.

If the foundations or the piling under them are of such length as to reach a solid stratum, then the full severity of the earthquake shock is transmitted through the foundations to the entire structure, while, if the foundations rest on a soil of somewhat resilient nature, the transmission of shock will be very much less.

Structural Steel

Columns should be placed in straight lines in each direction so that at every panel there will be a maximum number of points of resistance. The sections of the columns should be as wide as possible in each direction and should be connected at each floor by girders as deep as the requirements for head room will permit. Both columns and girders should be latticed if the computation of stresses does not require solid web plates. If solid webs are required, then the webs should be punched at frequent intervals to permit of the proper application of reinforcing steel as will be touched upon later. Between the girders at each floor will be the necessary steel beams for carrying the reinforced concrete floor slabs.

In cases where head room or clear interior spaces are absolutely necessary, then resort must be had to knee braces. It is recommended, however, that such rooms as absolutely require great height or clear interior be placed on the top story or as near thereto as possible. Rivets for connection of girders to columns should be in shear, wherever possible. Rivets in tension should be studiously avoided.

Reinforced Concrete

In all cases, the specification for the mixture for reinforced concrete should be made after a study of the screen analysis of the coarse and fine aggregates available for use. No assurance of success can be had by the adoption of arbitrary proportions for the materials to be used. The water content should also be carefully considered and only a sufficient amount of water used to enable the practical working of the concrete into the forms.

Exterior piers around steel columns should be of reinforced concrete and as large as possible, extending from the frames of openings on each side and from the heads of window frames below to the sills of window frames above.

Interior columns and connecting girders should be entirely covered with concrete, thoroughly reinforced around and through the columns and longitudinally.

Build solid reinforced concrete walls wherever possible between columns in the interior and also around such places as elevator shafts, stair wells, pipe shafts, and vent shafts.

Wherever possible build solid reinforced concrete walls from basement to roof and from outside to outside walls of building, leaving only such openings as are absolutely necessary for ingress and egress and reinforce the perimeters of such openings in a thorough manner.

Exterior Facing

Avoid the use of brick or stone veneer, if possible, using only stucco work or thin tiles and forming the outlines of projecting cornices, belt courses, etc., as largely as possible in reinforced concrete.

Partitions

If impracticable to use reinforced concrete partitions, the next best in the order named are metal lath on steel studs solid brick, hollow brick, hollow clay tie. Reinforced concrete is, of course, recommended because of the additional stiffness thereby awarded to the structure as a whole, but if this seems impracticable, then use metal lath.

Lighting Fixtures

Lighting fixtures should be either in direct system secured flat against the ceiling or should have stiff suspension.

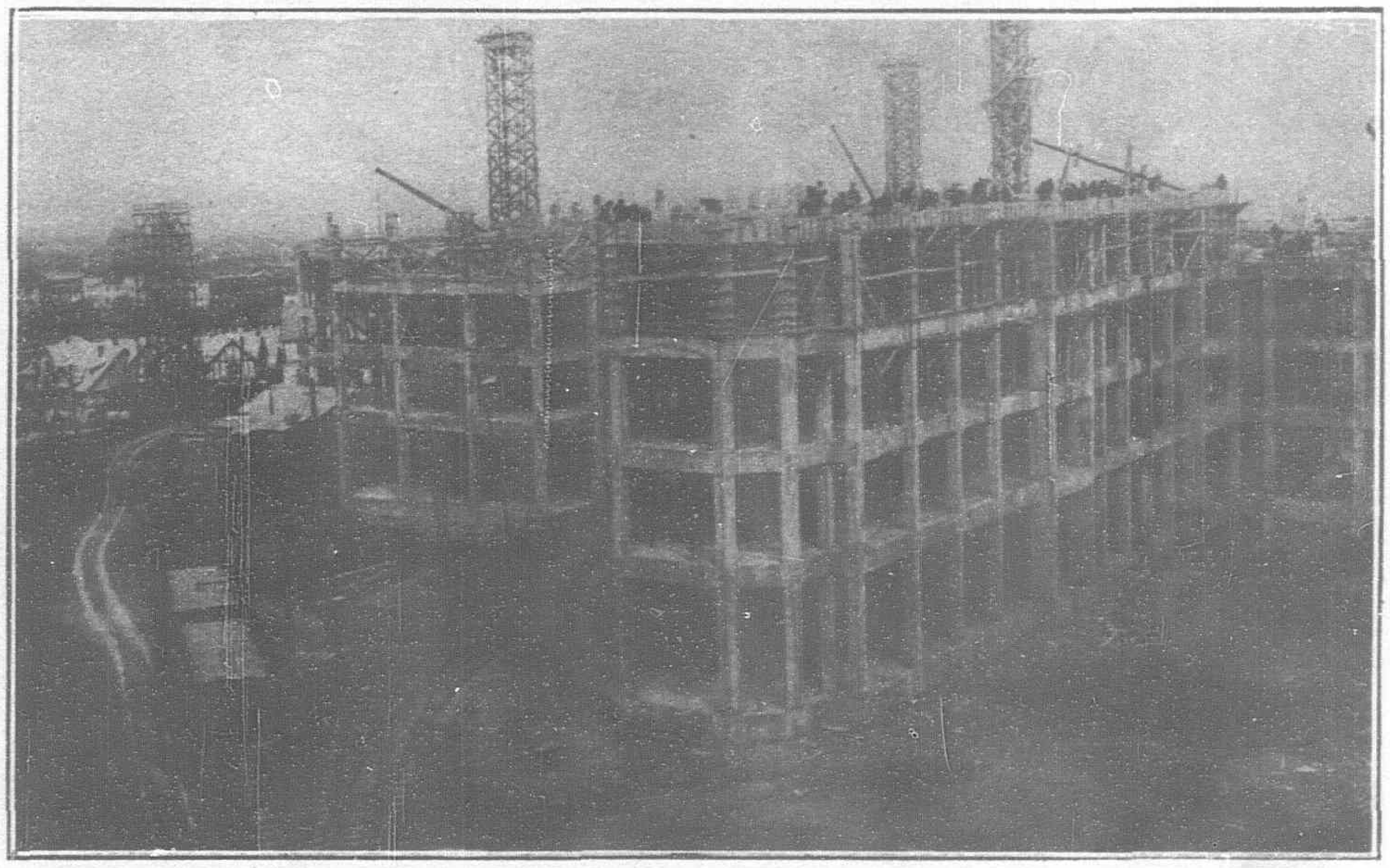
Marble

Use a minimum amount of marble slabs if the marble is to be attached to walls or columns.

Qualifications as Architects

Above, the damage done to the Marunouchi bldg., Tokyo, by the recent earthquake, has been described, together with the expert opinions as to what new provisions should be made in regard to future structures to render them as immune to earthquake shocks as humanly possible at the present stage of progress of science.

A competent architect will readily be satisfied of the intrinsic value of the skill and experience displayed in concrete form in the construction of the Marunouchi bldg. Especially, there are cases for comparison in plenty. Far from us to extol the builders of the Marunouchi bldg. from an inspired motive. There are the plan facts of how the same Edifice has weathered the terrible shock. Besides, the lesson the earthquake has taught has already been set forth in black and white. The newest knowledge just acquired is certain to be made use of in the erection of the General Hospital, Dairen.



All the building materials were hauled to the site of the New S.M.C. Hospital by electricity. This view was taken on November, 1923.

Very likely, the San Francisco earthquake has given many valuable hints to the construction experts now interested in the new hospital buildings. These hints must have guided them in the erection of the Marunouchi bldg., and now they are made doubly wiser through the severer earthquake about Tokyo.

People may say Manchuria has been free from seismic disturbances, and no such pains as is necessary to be taken in Japan is demanded in putting up a new building in Dairen. They might even add that adequate provisions against possible earthquake do not make a strong recommendation for construction work in Manchuria. Being a perfect stranger to what risk there exists for Manchuria to be visited with a strong earthquake sufficient to cause a devastation as terrible as those of San Francisco and Tokyo, we might agree to the above contention. However, the recent disaster being entirely unexpected, the good precaution provided against such a calamity may readily imply that in other respects, too, such as durability, resisting power, etc., provisions have also been made to a degree above reproof.

We may add in this connection that the plans in the cases of the Marunouchi bldg. and the General Hospital, Dairen, have been drafted by Japanese architects and Messrs. Fullers have followed these plans in construction.

How Far Construction Work has Progressed at Dairen

The ground comprises 960,000 sq. ft. The progress of construction made so far (November, 1923) may be called 45 per cent. of the whole; in point of money, 30 per cent. has been laid out; and as to time, some 38 per cent. has been passed. In structural frame, the fourth floor has been completed all round, and the columns supporting the fifth floor are now receiving attention.

The labor gang is composed of about 900 Chinese recruited through the local labor-keepers. They are under Japanese foremen, through whom only the Chinese are employed. This principle is seldom departed from. However, the Chinese include also skilled workmen such as carpenters, blacksmiths, stone masons, concrete mixers, etc.

At the outset, what means of transporting building materials should be adopted was debated upon. The relative merit of carts, motor trucks, and a railway siding was studied. An approximate total of the weight of all building materials was computed. If carts were to be used, 120,000 cartloads would have to be carried in, and as many as 600 cars might have to be jammed into the compound at a time on occasion. Besides, the tear and wear to the city roads would be frightful. This idea was plainly untenable. The idea of using motor trucks appealed as little. For, twenty or so of them would be required, and they would be constantly subject to damage, not to mention the inconvenience in loading and unloading. The final choice settled upon a railway siding, and the work of laying one from the eastern circle at the entrance to the railway wharf compound was started on March 31, only a day or two later than the day on which the ground was consecrated by the Shinto rite in the presence of Mr. T. Onogi, then chief architect of the S.M.R. Co., and Mr. W. S. Sample, general manager of construction of the American firm, who had come to Dairen on December 24, 1922, almost direct from America, etc. He had merely touched at Yokohama and Tokyo on the way.

The first train load of materials arrived in the ground on June 6.

The grading work and excavation had been commenced on April 10 and were finished on July 27. The first concrete had been laid for the foundation on May 2. The geological structure of the building site was of rocky character, which is good enough for ballast in road building, but too soft for concrete. The rather brittle nature of the rocky stratum made it an elusive article for the drills to handle, but the inconvenience felt on this score was only nominal.

Granite is obtained from a point at about 4 miles from Hsiungyocheng (famous for its hot springs). It is carried down south by railway as far as goods platform No. 2 close to the tram car sheds, Dairen, and then switched off into the temporary construction siding, to be brought past the war memorial and around the pond and the girls' high school, right into the ground. Ballast is brought either from Kochenpu, between Choushuitzu and Nankuanling, to which a siding runs from the main line, or from Hoshigaura. In the former case, the same route of conveyance as granite is taken.

With the latter, goods tram cars are used as far as below the West Honganji Temple, where the new temporary siding meets near the official residence of the commissioner of customs. Sand is carried from Shihho, a wayside station north of Chinchou. Cement is had from the Onoda Cement Factory, Choushuitzu, and bricks (tapestry brick, common brick, and partition tiles) are obtained from the Yingkou Brick Kiln, Choushuitzu. Lumber comes all the way from Changchun.

As work advances, window frames, door frames, glass, paint, lime, plaster, etc., will be procured from local or Japanese sources. The only articles for import from the United States will be reinforcing steel bars, boilers, hardware, and plumbing fixtures.

We have shown what care has been taken to let the Japanese see that, in both talent and material, the Japanese resources are drawn upon as far as possible.

The Chinese coolies are paid twice a month through their respective foremen, and a number of them are quartered in the sheds put up in the ground.

As to the construction siding, when the building work has been finished, it will be included in the city tram service. Although the rails are laid for railway trains, they are good also for electric tram traffic, the gauge being the same. Only the siding will be available for no goods cars above 30 tons each in carrying capacity.

The most interesting shop to a Japanese is of course the stone masons' shed, equipped with ten stone working machines imported from America not long ago. The men wear goggles while working one of them. Pieces of granite are carried into the shed by light rail right underneath one of the machines, which can cut, carve, and polish by the change of the tool alone. Even when only a few of them are being operated, the shed will be found full of clouds of white dust rising from the machines. They give, as may be expected, dinning noises.

A wholesome sign of industry and discipline will impress a visitor in the ground. Few coolies retain the customary easy going air about them. Every fellow is at work, plainly showing that he really means business and takes a keen personal interest in what ever work is assigned to him.

Firm's Main Office, Dairen

Turning to the management of the Oriental department of the famous American builders, Mr. James Lee Kauffmann serves as managing-director at Tokyo. Through his preliminaries, the firm has obtained the General Hospital contract from the S.M.R. Co. Unless something unforeseen turns up or extra work is undertaken, the total construction estimate is thought unlikely to exceed Y.3,000,000. The commission, to which the firm is entitled, is said to be at 13.5 per cent., as against 15 per cent. secured for the Marunouchi bldg., Tokyo. The firm now keeps its main office at Dairen, with Mr. Wilbur S. Sample and Mr. J. I. Traphagen for joint managers.

What the Huge Edifice is Like

The gigantic edifice will face on the north. The main building, which is for the administration is 52 metres (from east to west) by 16 metres (north to south). It is six-storeyed and has a wing projecting in a straight line at each end, southward and northward, leaving a front yard embraced by the wings, each 3 storeys high. The western wing is for consultations for the different divisions, of which there are nine—Interclinique, surgery, ophthalmology, rhino-laryngo-otology, dermatology, gynecology and obsterics, dental surgery, psychiatry and bacteriology. The eastern wing is for library, auditorium and archives. There are two other wings to the main building extending symmetrically westward and eastward, each being five storeyed. The one belongs to the Surgical department and contains operating room, class rooms for nurses, etc. The other wing contains rooms for X-ray and genealogical treatments, and functional examination.

The main building leads rearward by a covered corridor to the rooms for special treatments of the same length and width with, and parallel to, the main building. Rooms for gymnastic, electric, and hydrotherapuetic treatments, and massages of different kinds, pharmacy, and laboratory are found therein. It has a wing extending each 66 m. in length westward and eastward, 11 m. wide. These are sickwards. They have each another ward a little distance in the rear, running parallel thereto. They are also wards. The extremities of the four wards, all four storeyed, are Solariums or sun parlours, novel acquisitions to Dairen.

Both the main (administration) and the Speal treatment rooms have each a basement, and therein sterilizing-, store-, motor-, fan-, air-conditioning-, and cold storage-rooms, besides dispensary, laundry, refrigeratory, and lunch rooms are contained. The fans are for ventilating purposes and take the form of squirrel cage blowers. Another new feature is the air-conditioning, by which means the air in any particular part of the building may be dried, humidified, or purified.

The power house is to be built separately, but is not included in the contract, although there is a good chance of its being added thereto later, with the Mortuary which will be located in the most obscure corner. We understand that heating is to be effected by steam and by means of wall radiators or electric thermastadts.

New Yarrow Steamer for the Upper Yangtze

Yarrow & Company, Ltd. of Glasgow have secured an order for a large shallow draft river steamer for the Anglo-Saxon Petroleum Co., for service on that part of the Yangtze Kiang that lies between Ichang and Chungking where the navigation is rendered both difficult and dangerous by the many whirlpools and rapids that have to be encountered.

The vessel which will be of the Yarrow type is specially designed for this service for carrying oil fuel in bulk. The propelling machinery will consist of two sets of triple-expansion engines developing a total power of about 3,000, steam being supplied by two of the latest type of Yarrow patent water-tube boilers suitable for oil burning.

The design of this steamer will follow very closely the large number of river gunboats Yarrow & Co., Ltd. built for the British admiralty during the war, the whole flotilla of which was designed and built by them and for which they took the responsibility.

* * *

Japan Notes

The Japan Steel Tube Company, (Nihon Kokan K. K.), Tokyo, was operated at one-half of its capacity during November. The loss of the company arising from the disaster is reported to have amounted to Y.500,000 in round figures. It is also said that the company can make dividends on its preferred shares only.

* * *

The Kinugawa Hydro-electric Power Company supplied 35,700 k.w. during November, 1923, two-thirds of its total capacity. September, it supplied one-third of its entire capacity and in October, one-half. One of its 6,000 k.w. steam generators in Tokyo has been destroyed by the earthquake, and a budget of Y.119,000 has been approved for its renewal. The business of the company has been greatly improved by the revision of contract with the Tokyo municipality.

* * *

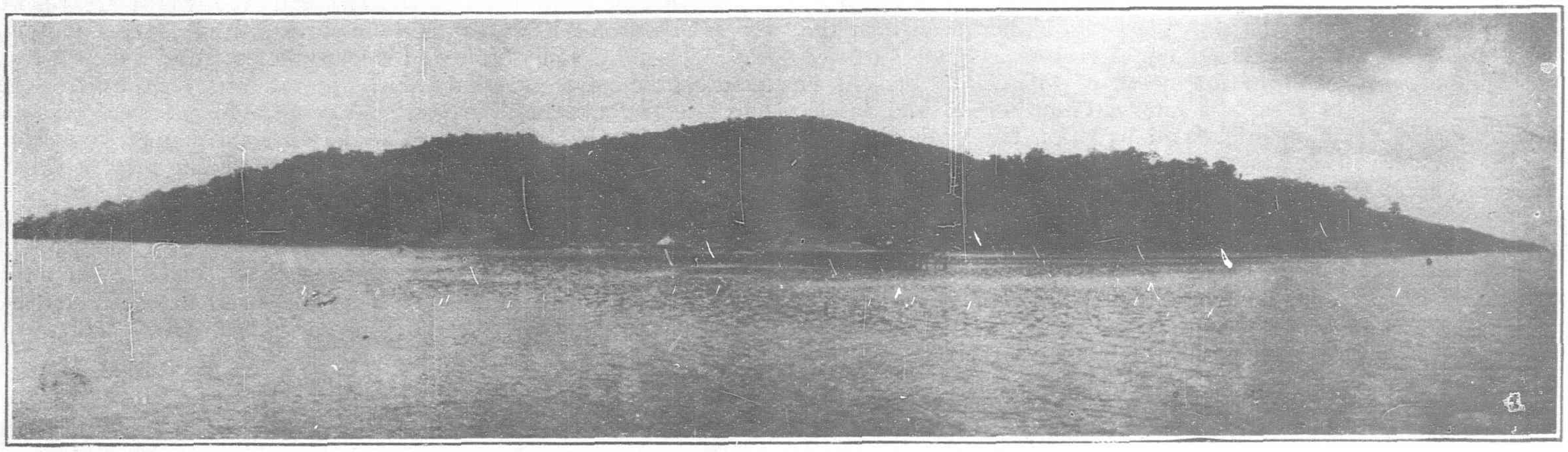
The Uraga Dockyard Company (Uraga Senkyo K. K.) decided to reduce its authorized capital of Y.10,000,000 to Y.7,000,000 at its general meeting in November last for the purpose of making up the loss of Y.4,000,000 caused by the earthquake. The decision, however, was not authorized as the number of attendance at the meeting was short of the legal number.

* * *

The Tokyo Gas Company loan of Y.3,000,000 has been guaranteed by the Dai Ichi, Jugo and the Mitsubishi Banks for restoration funds. It is reported that these three banks will get more funds for the company.

* * *

The establishment of the Sangu Electric Railway Company, which proposes to connect the cities of Nagoya and Uji-Yamada by a high speed electric railway was effected at the meeting held under auspices of the Toho Electric Power Company, mayors of Yamada, Tsu & Yokkaichi, in November last, with a capital of Y.1,000,000, (200,000 shares). Of the total number of shares, 130,000 will be taken by the Toho Electric Power Company, and its allied companies, while the rest, amounting to 70,000, will be sold to the public in Mie prefecture.



Panorama view taken from on shipboard. looking shoreward

The Liguan Coal Mines

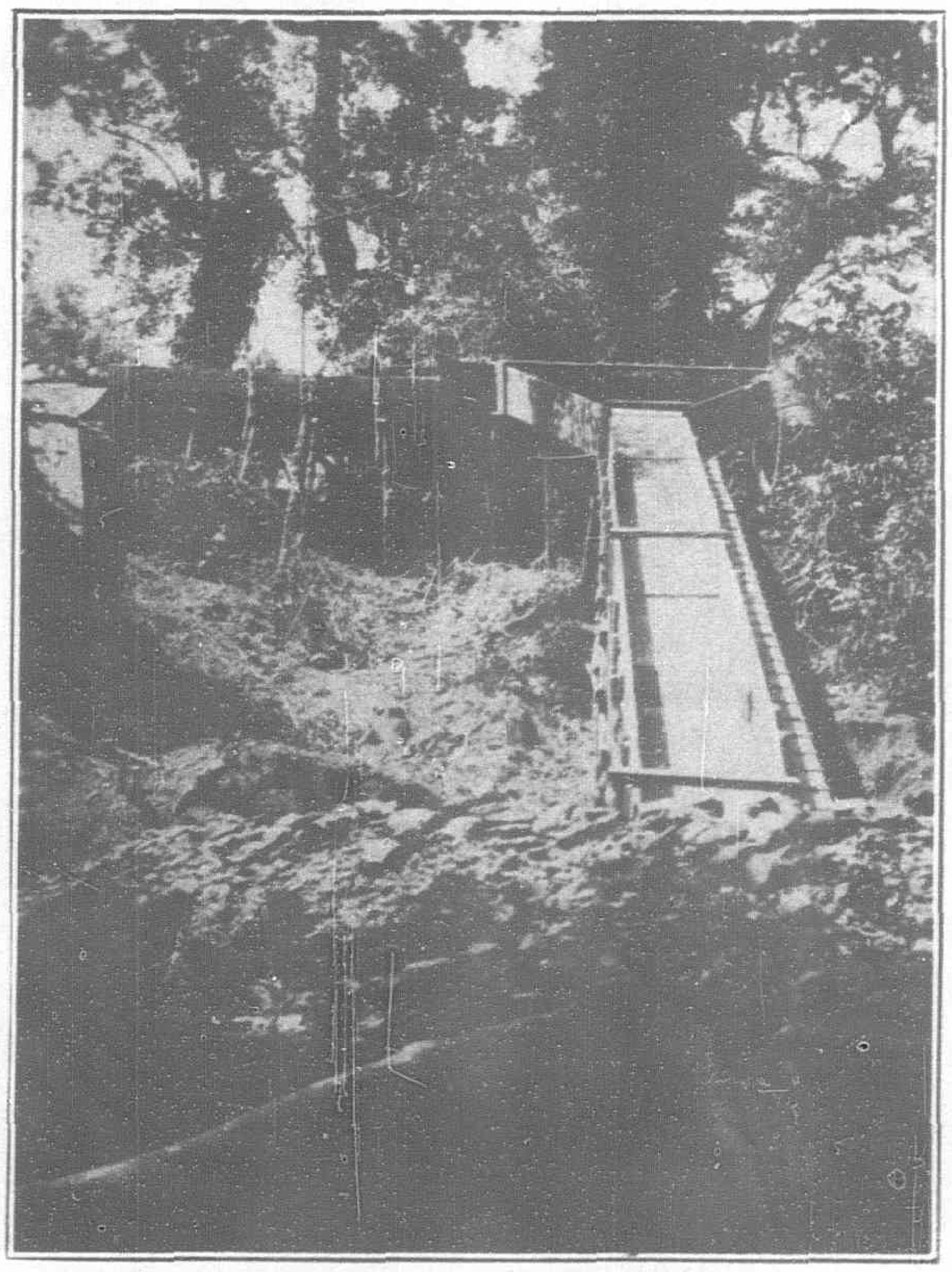
AMERICAN initiative is giving gradual development to the natural resources of the Philippine Islands.

In northern Luzon, American initiative and American capital are aiding in bringing a wealth of gold to the surface monthly from the Benguet Consolidated Mining Company's plant.

Just across Manila bay is the Cadwallader-Gibson Limay lumber camp—where lands are being cleared for future agricultural needs and wealth is added to the country by the development of the lumber industry.

And down off the southeast coast of Luzon on Batan Island the coal industry is being developed by A. T. Hashim, Manila.

The mine at Liguan, Batan Island, is at present supplying coal to all inter-island vessels of the Gutierrez Hermanos the Ynchausti steamship companies and two government-owned vessels. Mr. Hashim is getting out a good output of coal each month. The most modern improvements in coaling have not been attained but plans are being made for installation of increased facilities within a few months.



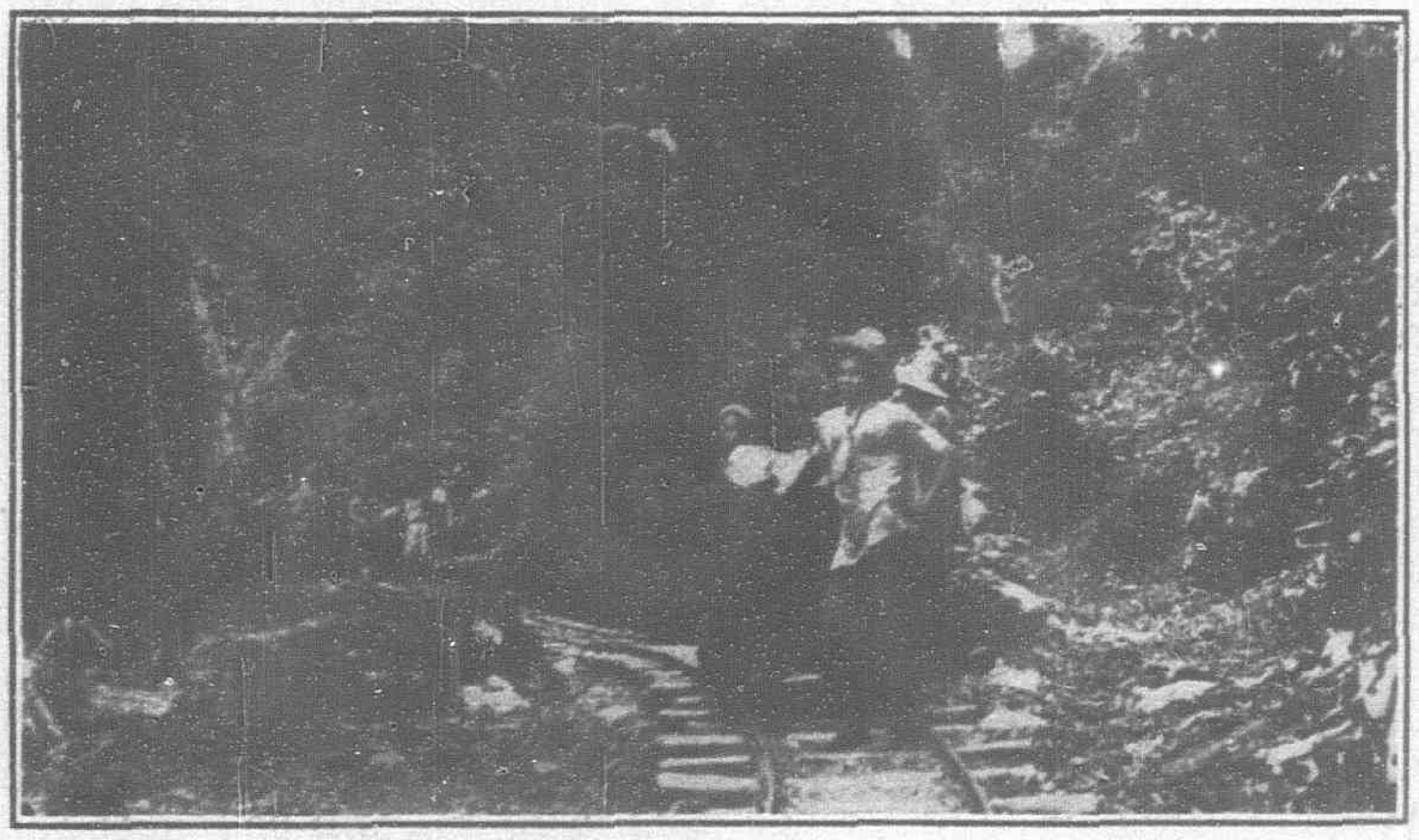
Geislin screen, 25 metres from Tunnel No. 5

Hashim purchased the mines at the first of last year. The mines were at that time in a rather run-down condition because of lack of capital for development even on a small basis.

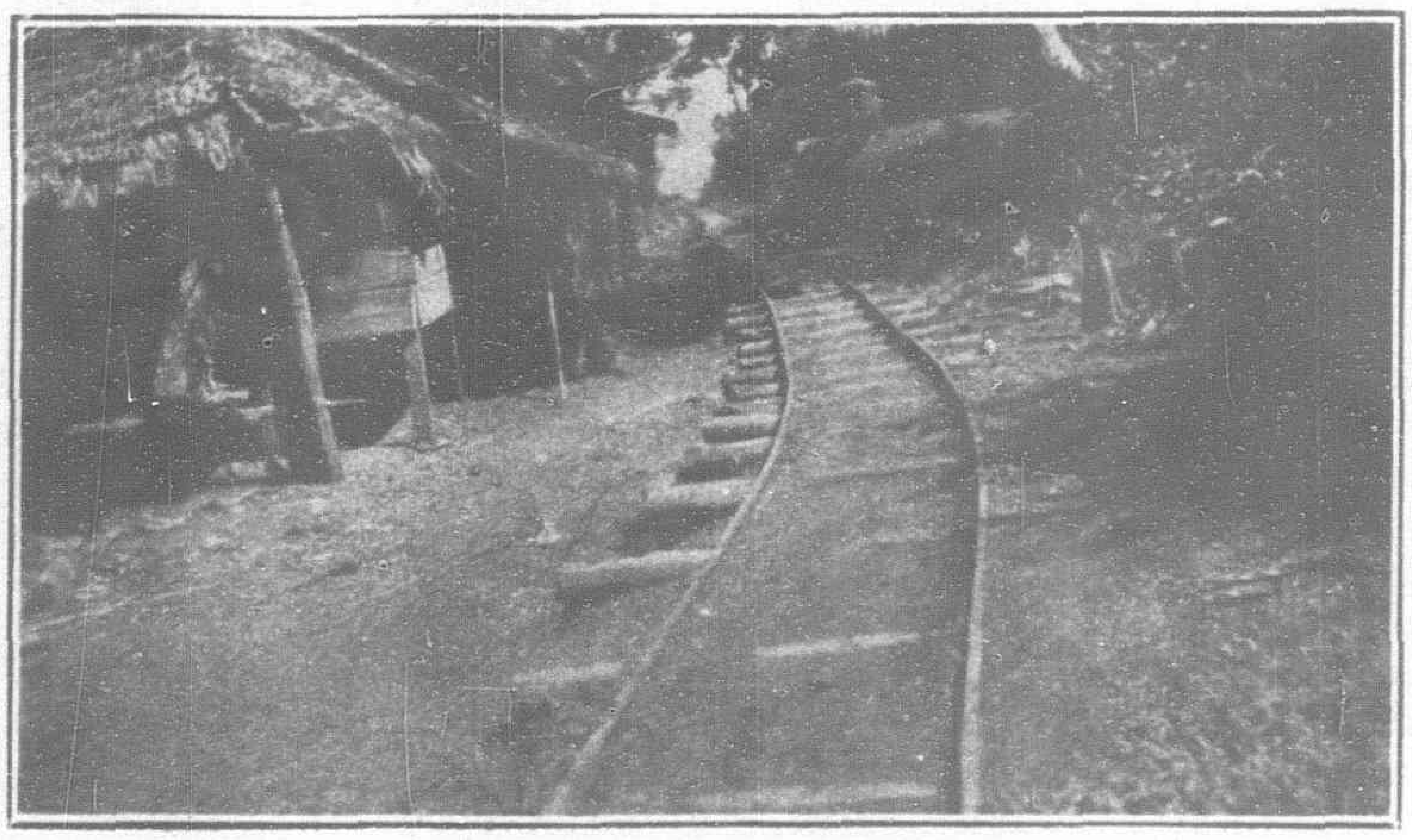
The mine is located on a deep-water harbor, thoroughly sheltered, and vessels of 30-ft. draft can be loaded alongside the wharf. This has a total length of 1,450-ft. of which 800-ft. goes straight out into deep water, and the remainder, 100-ft. wide, continues in an oblique direction, affording facilities for three large vessels to tie up and coal simultaneously. The coal is delivered by gravity to the pier in small coal cars, dumped and loaded directly. A record of loading 150 tons in one hour has been made.

Eight tunnels care for the entire output at present. Other tunnels are under construction and when finished the output will be 100 tons per day. Nearness of the mine to the shore is an important feature, economically, precluding the necessity for expensive equipment to transport the coal to the wharf.

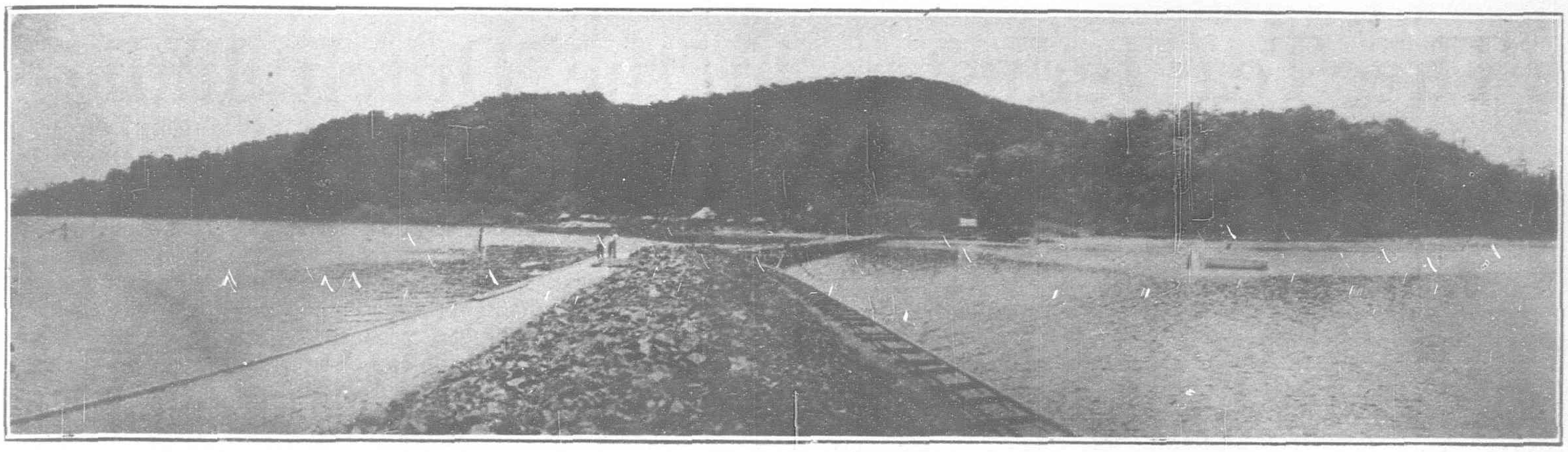
Work is carried on by native labor, approximately 150 laborers being employed now. The barrio of Liguan,



Loaded coal car at the level



View showing old Spanish tunnel, blacksmith shop and boiler, at sea level



Panorama view showing tressle, wharf and coal pile on wharf. Taken from outer end of wharf

short distance from the mines, built under the supervision of the mine management, is a sanitary town of the best type. More than sixty-five families live there. A large school building has been constructed, and the bureau of education established a school there at the beginning of the present school year.

Possibilities of development of the coal industry in Batan was seen in 1901 by the United States army when Lieutenant Edward Markham, engineer, recommended Liguan as a suitable location for government mining. This recommendation followed investigation of the prospects in the islands of Batan, Cebu, Negros, Mindoro, Mindanao, Semirara and Surigao.

Very little work, however, was done on the island and practically nothing has been done by the government since 1905. Only a little prospecting had been done because of lack of capital. Several private companies, however, have operated the mines for a short time.

Batan island is coral girt but there are breaks in the reefs, so that ocean-going vessels can come within 100 yards of the shore.

Liguan offers the best harbor facilities anywhere along the east coast of Luzon for 100 miles with an anchorage, perfectly sheltered from winds.

The Liguan Coal Mines embrace approximately 1,200 hectares of land.

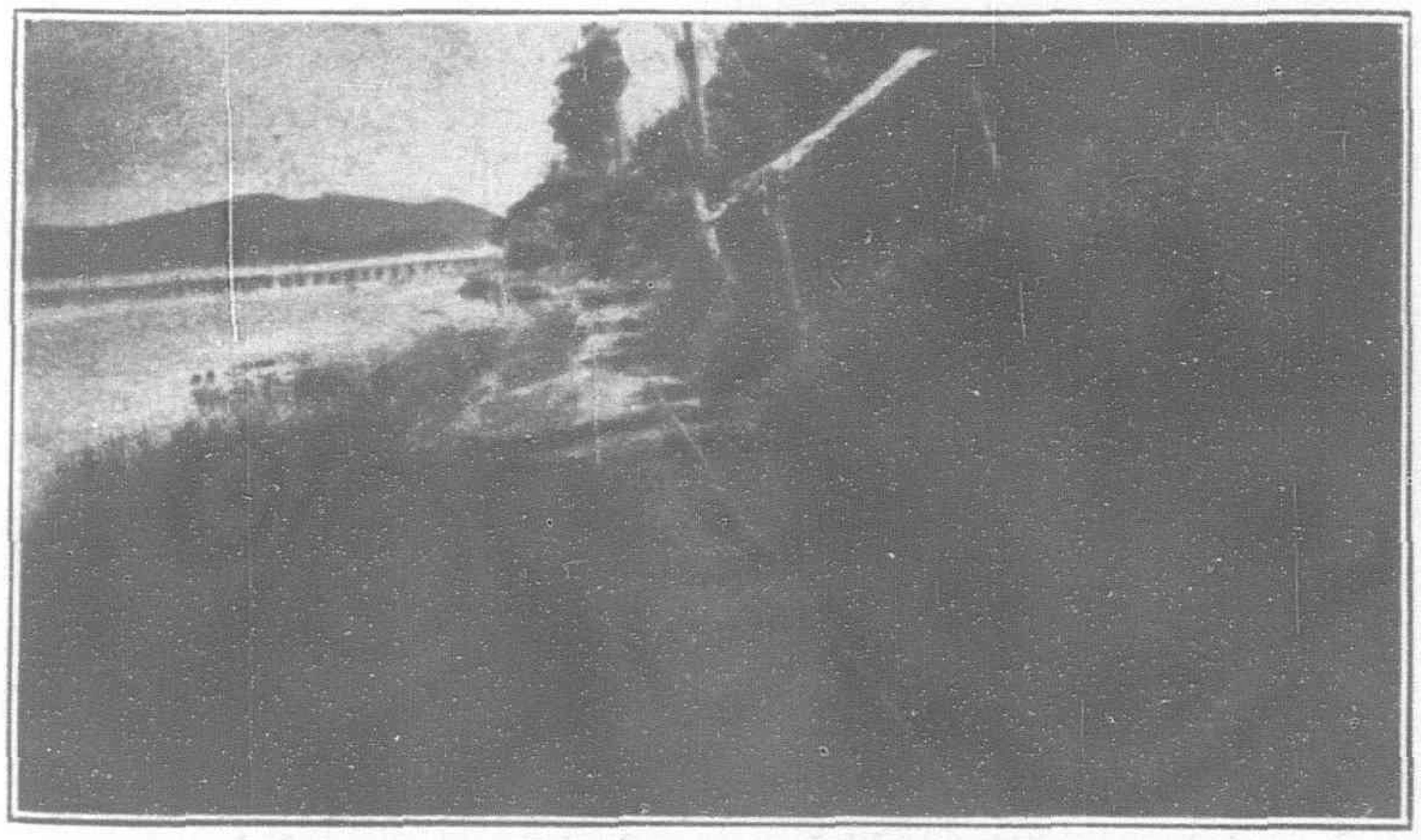
Loaded coal car coming down by gravity from mines to the wharf

Coals taken from the Liguan mines have been analyzed as comparing favorably with Japan, Wyoming, and British Columbia coals, which are in the same class.

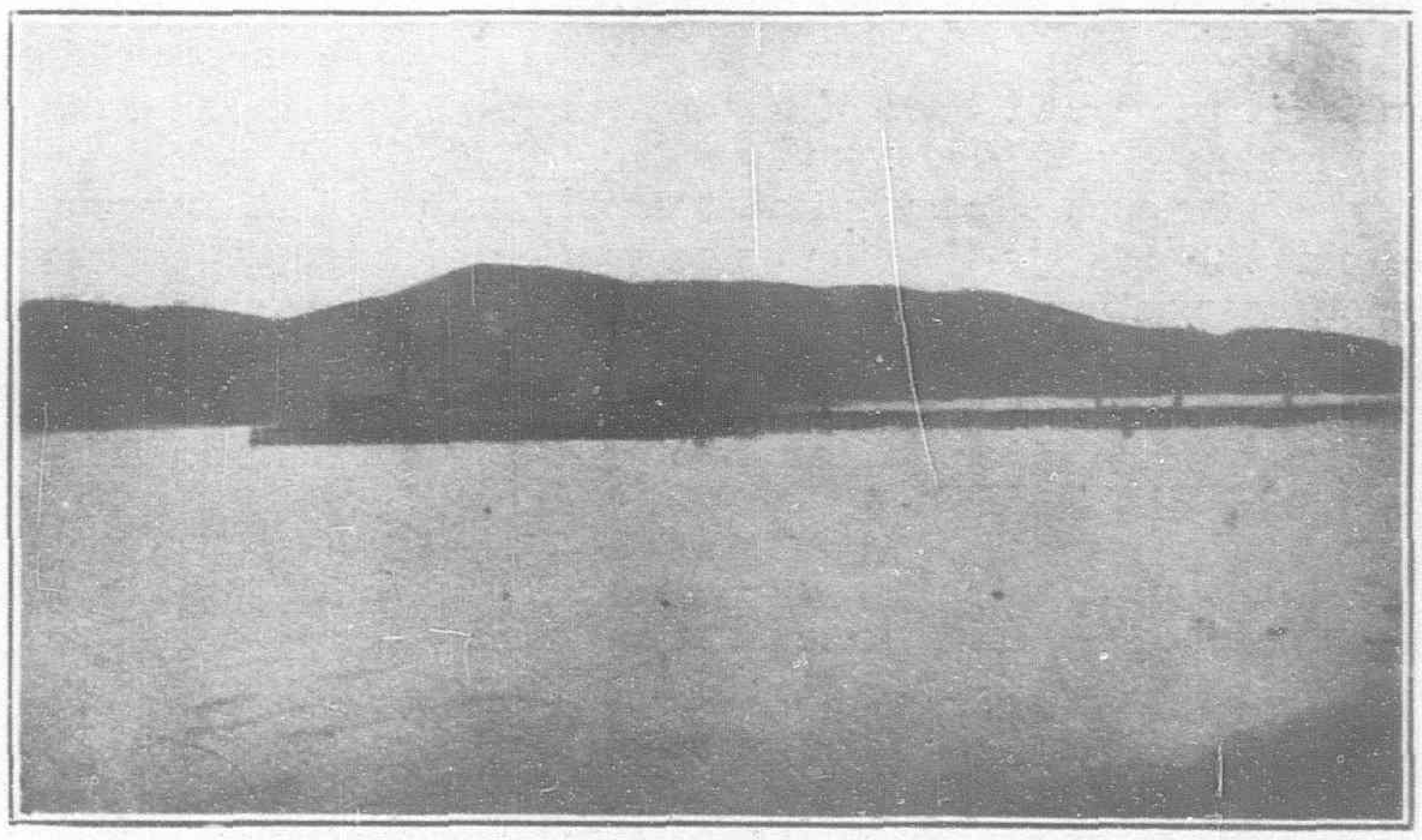
The coals, San Francisco and Big Tree, possess a good face cleat, an advantage in mining, and have fair adhesiveness and little sulphur, according to analysis by Dr. Warren Smith, former head of the mining division of the bureau of science.

Hashim isn't fearing a failure of the mine for a few years, either, he said recently. The tonnage per foot of thickness per acre for bituminous coal is generally estimated at 1,500, and there are several square miles of surface on Batan Islands, he said. The analysis of the Liguan coal, made by the bureau of science, shows:

	Per cent.
Moisture H20 ...	6.06
Volatile combustible matter	43.22
Fixed carbon ...	48.11
Ash	2.61
Total	100.00
Sulphur (determined separately) ...	0.77
Coking quality—Soft coking.	
Color of ash—Reddish brown.	
Total	.7129



Main line leading to the tressle connecting with the wharf



Inter-island steamer loading coal at the wharf

The Tea Industry in the Dutch Indies

By K. R. F. Blokzeyl

AMONG the successful agricultural industries in the mountainous parts of the islands of Java and Sumatra, tea is to-day undoubtedly the most important one.

The records regarding the industry in Java are so far as the early years are concerned somewhat disjointed, but the commercial connection of the Hollanders with the article is proved to have dated back as far as the beginning of the seventeenth century, when we learn that "a considerable and profitable trade was carried on in Europe in tea from China and Japan."

It was not, however, until 1728 that the United East India Company first imported tea seed from China into the island of Java, but unfortunately regarding the result of this attempt to share the industry with China and Japan, nothing is known and presumably it was a failure. No records are available of further experiments for nearly a century, but both tea seeds and plants were secured from Japan in 1826 and 1827, and the cultivation of tea was taken up seriously though these seeds and plants do not appear to have been successful. In 1829 plants were imported from China and in the following year the production of tea was taken over and handled by the government.

In 1832 practical tea makers were brought from China and in 1838 an establishment was erected near the town of Batavia where the product was brought from the various estates to be "finished," but owing to bad roads and primitive traffic arrangements in those days, the tea had frequently to be stored for several months before being sent for its final treatment. This, of course, caused serious deterioration in quality and the establishment consequently proved to be a failure and was eventually closed down.

Tea-plucking on an estate in Java

During the period from 1835 to 1846 the loss on the tea industry in Java ranged from Glds. 300,000 to Glds. 500,000 in total, to double that figure ten years later, while in 1860 the loss sustained reached the grand total of not less than six million guilders, or approximately 500,000 pound sterling.

Under such circumstances it is only natural that government decided to entirely abandon its connection with the tea culture as soon as existing contracts had expired. Thus, in 1865, several estates in the Preanger province were let to private enterprise, and on those lands the tea-growing industry advanced slowly but steadily, while other estates were gradually opened out in other provinces of the island.

The passing, in 1870, of the agricultural law in Java, which fixed the term of land leases at 75 years, had the effect of stimulating the interest taken in the industry, and the possibility of its eventually becoming a profitable one, appears to have been more fully realized.

The quality of the product, however, continued to be inferior, and Java teas could not compete with the superior article from British India. A considerable time had to elapse before any material improvement could be achieved, but in 1877 samples were sent to London to be reported on by the brokers there. This was a step in the right direction. Full reports, together with samples of British Indian teas, were received in return, and it is this which enabled Java planters to realize how much their product was lacking in quality and manufacture.

In 1878, tea seeds were procured from Assam, British India, and this may be looked upon to be the turning point in the career of the Java tea industry. The Assam plant, as a fact, proved an immediate and great success, and so this type has become the standard for Java and, afterwards also for Sumatra.

About this time hand-manufacture was done away with and machinery came in its place, bringing with it a further considerable improvement. Tea planters went on working steadily and, in 1882, formed a society known as the "Soekaboemi Agricultural Association." This society is a most useful institution. It deals with all questions of movement to the industry and takes a prominent part in any movement which has for its object the furtherance of the interests of tea planting.

In the nineties the industry received a further fillip by the interest which the then governor-general of the colony took in it, and by the constant encouragement which he bestowed on it.

In 1886 and 1892, two well-known Java planters visited British India and Ceylon, and the knowledge gained by them led to many reforms in the method of manufacture. Gradually, old and inadequate machinery was replaced by new and up-to-date appliances, and manufacturers were unanimous in their efforts to produce a better article.

In 1890, chemical investigations were commenced regarding Java tea and, in 1902, a further and very practical move was made by establishing a tea experimental station under government control. On the re-organization of the government botanical gardens, to which the station was attached since its establishment, it became, in 1905, incorporated as a sub-section in the then newly formed department of agriculture. The institution, which ever since its foundation has been run on entirely scientific lines, is supported by contributions from a large number of estates. Among the subjects specially studied by the tea experimental station may be mentioned: diseases of the tea plant and their remedies, the fermentation of tea leaf, the manuring and selection of the tea plant, and the control of imported tea seeds.

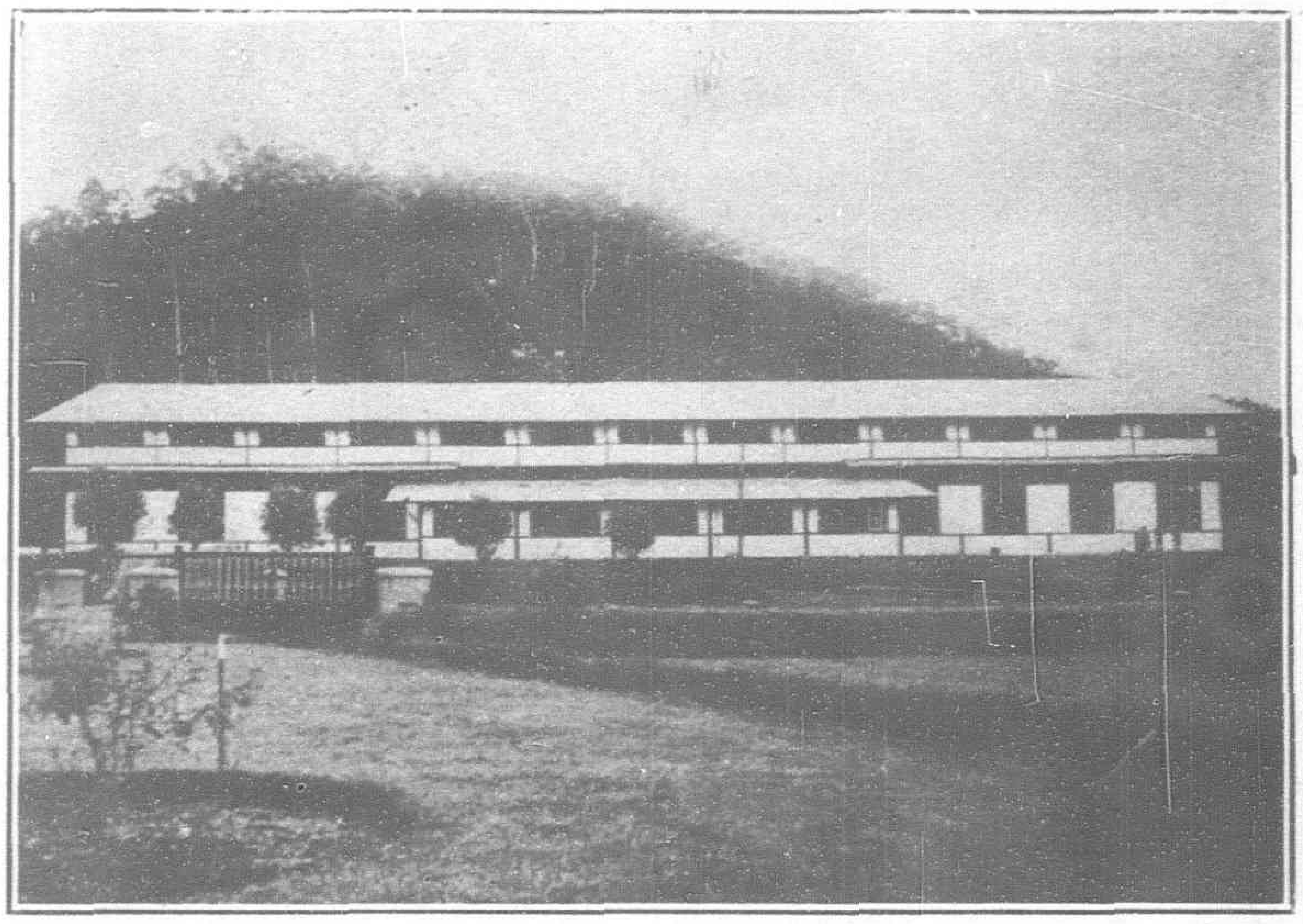
Besides the establishment of this institution, another step in the right direction was taken in 1905, when it was decided to make a determined effort to produce the very best quality of tea. For this purpose a union was formed by the leading planters and directors of planting companies, the object of which it was to decide upon the best means of improving the make of leaf, of sorting into the most advantageous grades, and bringing the quality of liquors to the highest commercial value. The union proceeded to elect an influential committee which secured the services of a tea expert with the highest qualifications and who possessed experience both of the London and the eastern markets. The office of this expert was established in practically the centre of the tea-producing districts and, as a result of his reports on the product, of his visits to the various factories and of his advice regarding manufacture, a very great improvement was in most cases effected. So the general quality average of Java tea was raised and this improvement reflected in the prices obtained.

It is chiefly during the last two decades that the tea factories in Java have been completely modified, which was necessary, partly because Assam tea requires a different preparation altogether, and further on account of the competition with other tea-supplying countries, necessitating a higher standard of perfection of the product. Tiny factories, where tea was withered in the open air, rolled by hand and dried over charcoal fires, made way since the end of last century for modern equipped establishments in which neither trouble nor expense were spared to keep them continually equipped with the latest inventions relating to tea machinery and methods of manufacture.

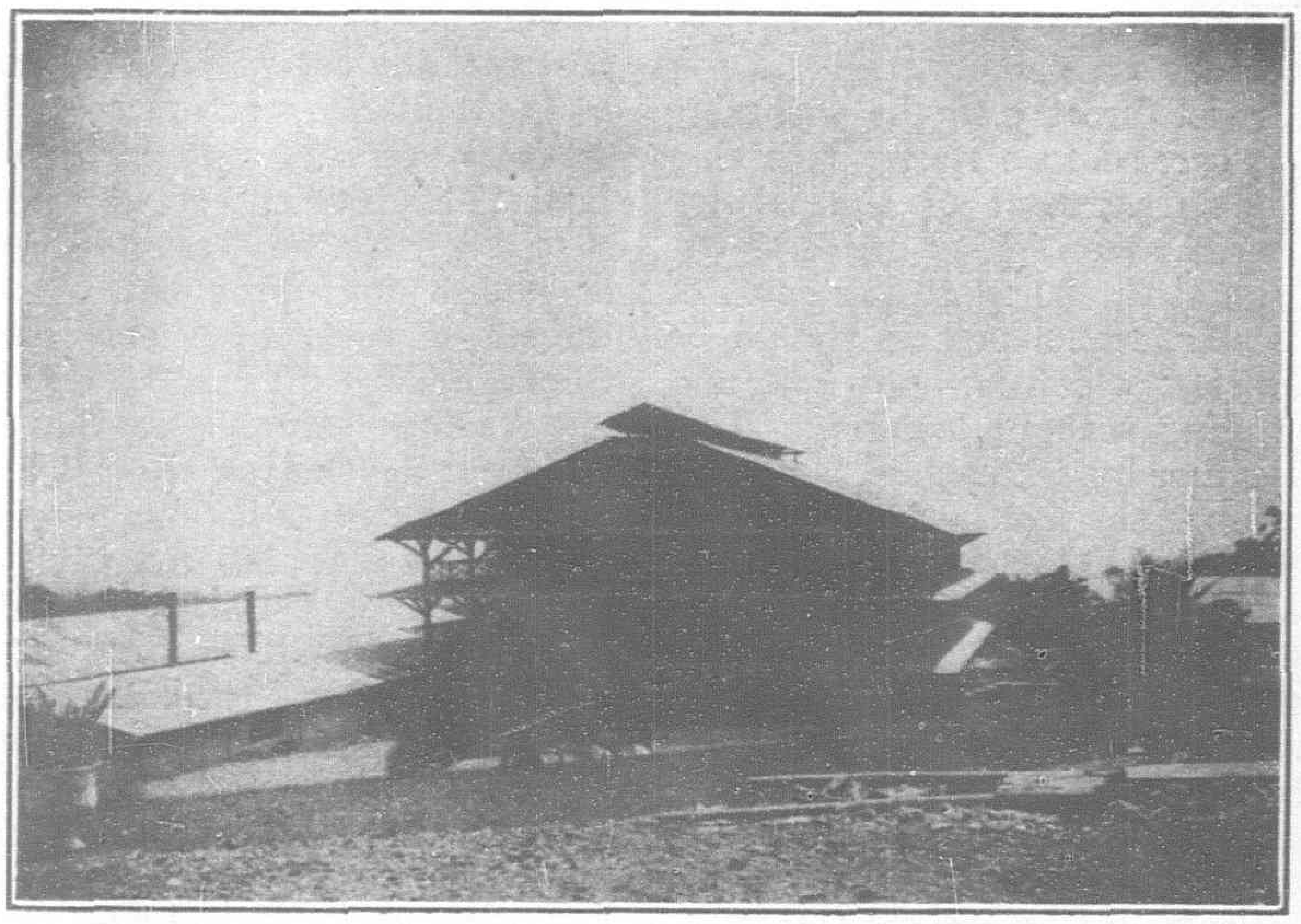
Speaking generally, the largest and best production is obtained from gardens situated at a height of from 1,000 to 3,000-ft. above sea-level. It may be well assumed that on grounds situated higher up a better quality is obtained, but the crop is less abundant. At a height of from 300 to 400-ft. the crop is larger but at the expense of the quality.

In regions where there is a sharp contrast between the dry and the wet season, the tea plant is not at home. Places with a regular rainfall and a sub-tropical climate, therefore, are the most suitable to its cultivation. The Preanger province in West Java, and the mountainous slopes and high plains of the east and the west coasts of Sumatra, are regions which fulfill all requirements of the tea-growing industry. Especially in the first mentioned province the cultivation has attained a high level. In Sumatra the area under tea is still small, but everything indicates that in the near future plantations over there will also attain very considerable proportions.

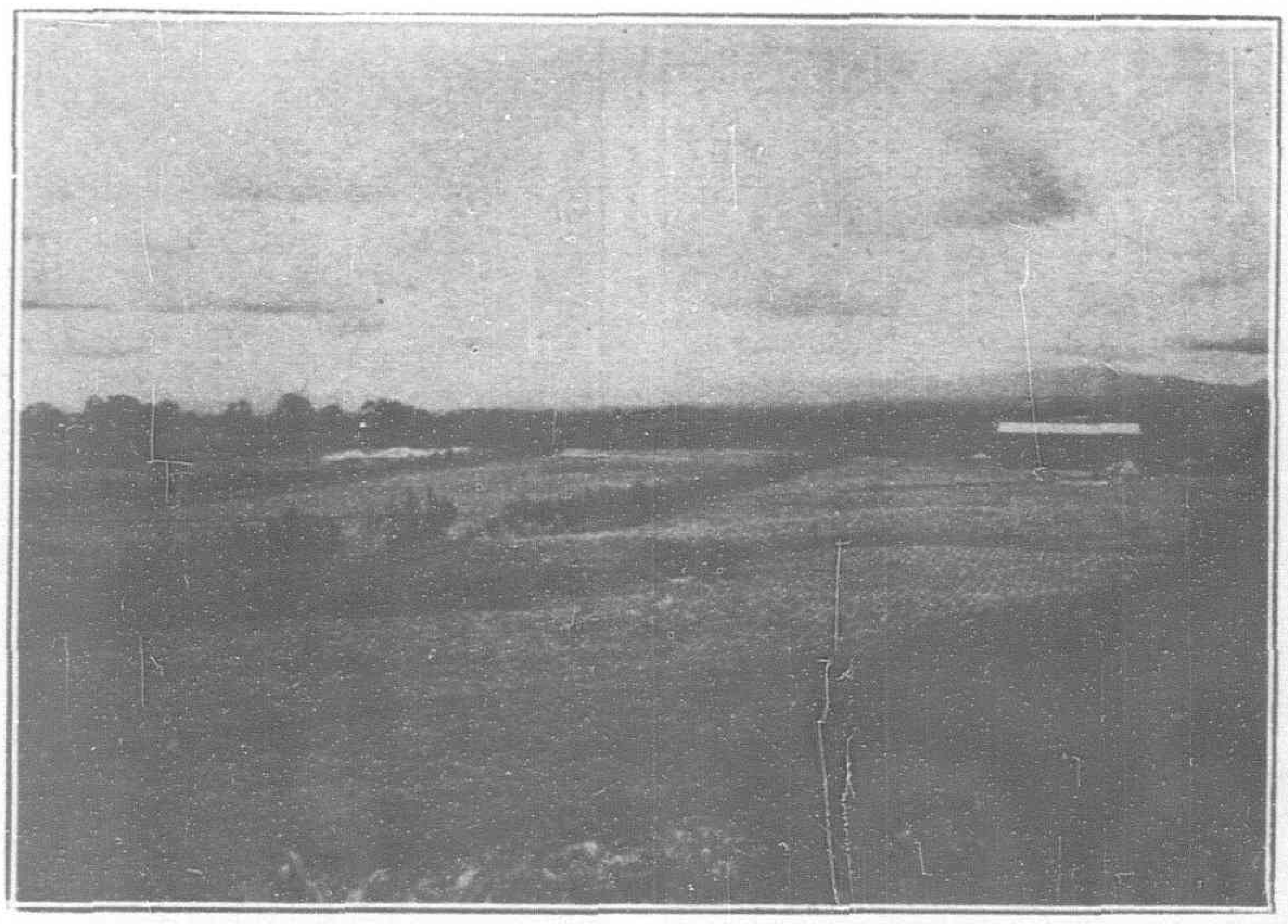
There are to-day in the Dutch East Indies 284 tea estates, with an area of 228,000 acres, of which 210,000 acres are in production. Of these 284 estates 256 are in Java (225 in West Java), and 28 in Sumatra. The total production in 1922 was 43,401,500 kilos, and of this 5,705,500 kilos were "kampong" teas (*i.e.*, teas grown by the native population), or about 14 per cent. of the total output. These teas were grown on about 53,000 acres.



A typical tea factory in Java



Wooden "chung" for withering of tea leaf and tea factory on the left



View on tea estate and factory in Sumatra

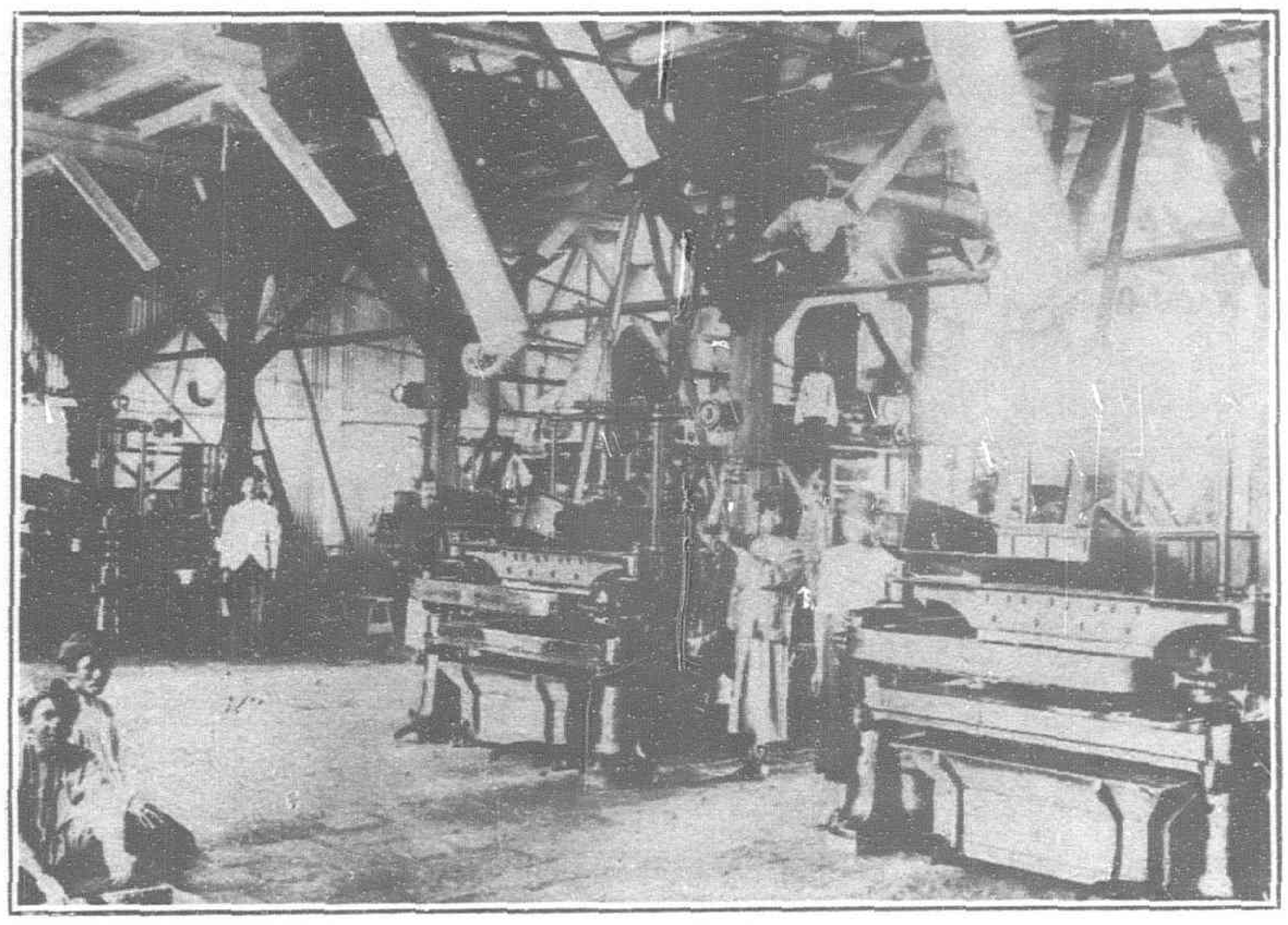
The total capital invested in tea in the islands Java and Sumatra is approximately 10,500,000 pound sterling, of which British capital amounts to 3,000,000 pound sterling, or 35 per cent. of the total sums invested. Other foreign interests are small and would have but little effect on the percentage.

It may be remarked here that the industry in Sumatra is comparatively of young age, and almost entirely in British hands. About 1910 a company was formed to exploit the island for tea growing. The enterprise on the whole has been successful, in spite of many difficulties, the principal one—until lately—being that labor had to be imported from Java.

The upkeep of tea gardens requires a great deal of care. The weeding must be properly attended to in order that all noxious growths may be removed. The soil must be loosened, thus allowing the air to penetrate easily to the under layers. Care must also be taken to construct drains with a length of from 3 to 6-ft. between the shrubs. These drains are of great importance; by means of them the open air is able to penetrate to the plant roots, while during heavy showers they break the force of the rainwater, thereby preventing the fertile soil from being washed away. The humus which is washed off by the streaming water is not entirely carried away but lands largely in the drains. They also serve as gathering places for the pruned off leaves and branches, which together with dried weeds can be converted into humus.

A very important work in the gardens is the pruning. If the bushes are allowed to grow on regardless, they would not only be difficult to pick but the crop would be far from satisfactory. Through pruning the attempt is made to give the plant such a form that it will give as much leaf as possible and so that this can be easily picked. Pruning is done at varying intervals. In young plantations it is done to obtain well developed bushes, while the pruning which takes place about every five years in older gardens aims at increased production. There is also considerable difference in the methods of pruning. One rather common form is the table pruning, in which all the bushes attain an equal level, while each in itself displays the table form.

Tea leaf usually begins to be picked when the bushes have arrived at the age of three years. As a rule, the picking is done by native women, either from settlements on the estates or from "kampongs" (villages) in the neighborhood of the plantation. It would be preferable that all the leaf



Three double action tea rollers. These machines are filled with leaves through the white tubes constructed above them

suitable for picking be looked for every day throughout the entire estate, but this is practically impossible, since there is not enough labor for such a task. One must, therefore, be satisfied, especially on large estates, with the picking of certain tracts, so that within eight or ten days every part of the plantation has had its turn, after which the work is begun all over again.

An estate may pick either for quality or for quantity. In the first case only the peco, *i.e.*, the fuzzy white and leaf which is still unfolded, and the two leaves below are picked. In the second case three or four leaves are taken besides the tip. A very fine quality, the so-called gold-tip peco, is obtained by taking only one leaf along with the unfolded leaf end.

The leaf is usually carried to the factory by the picking women themselves. In Java a piece of cotton cloth is used for this purpose, in Sumatra baskets are used. Motor trucks are now also in use. In order to ensure good ventilation, the sides are fitted with wiregauze which keeps the leaf fresh and prevents undue heating. Some estates use trays, made of wooden frames with wiregauze bottoms, which are placed one on top of the other in the cart. Wire-shoots are not yet used extensively, as many systems are unreliable and necessitate frequent repairs. On the other hand some systems seem to be very satisfactory.

On some estates the leaf is carried directly to the withering sheds or lofts, but usually it is first carried to a roomy receiving shed where the leaf is weighed by an assistant of the factory manager.

In withering the leaf should lose about 30 to 40 per cent. of its weight by the evaporation of water, which process should be done without undue damage to the leaf, which becomes soft and pliable so that it can stand the rolling without breaking. This can be accomplished in two ways,—either by a " natural " method or by an artificial. In the first instance the leaf is simply spread out in thin layers and exposed to the air, either on the ground of the loft or on large flat trays, or, as is more customary, in a " chung," *i.e.*, a wooden shed with several floors each containing racks with wooden shelves. These racks are placed back to back in pairs, and between these are passages for the coolies who carry the leaf and spread it on the shelves. Every rack consists of a number of wooden shelves at a distance of about 8-in. above each other. They are either horizontal or have a slight slope towards the passage. The leaf is spread evenly in a thin layer on the shelves and it remains on it for about 16 to 18 hours. The whole building is placed in such a way that the prevailing wind blows along its longitudial axis.

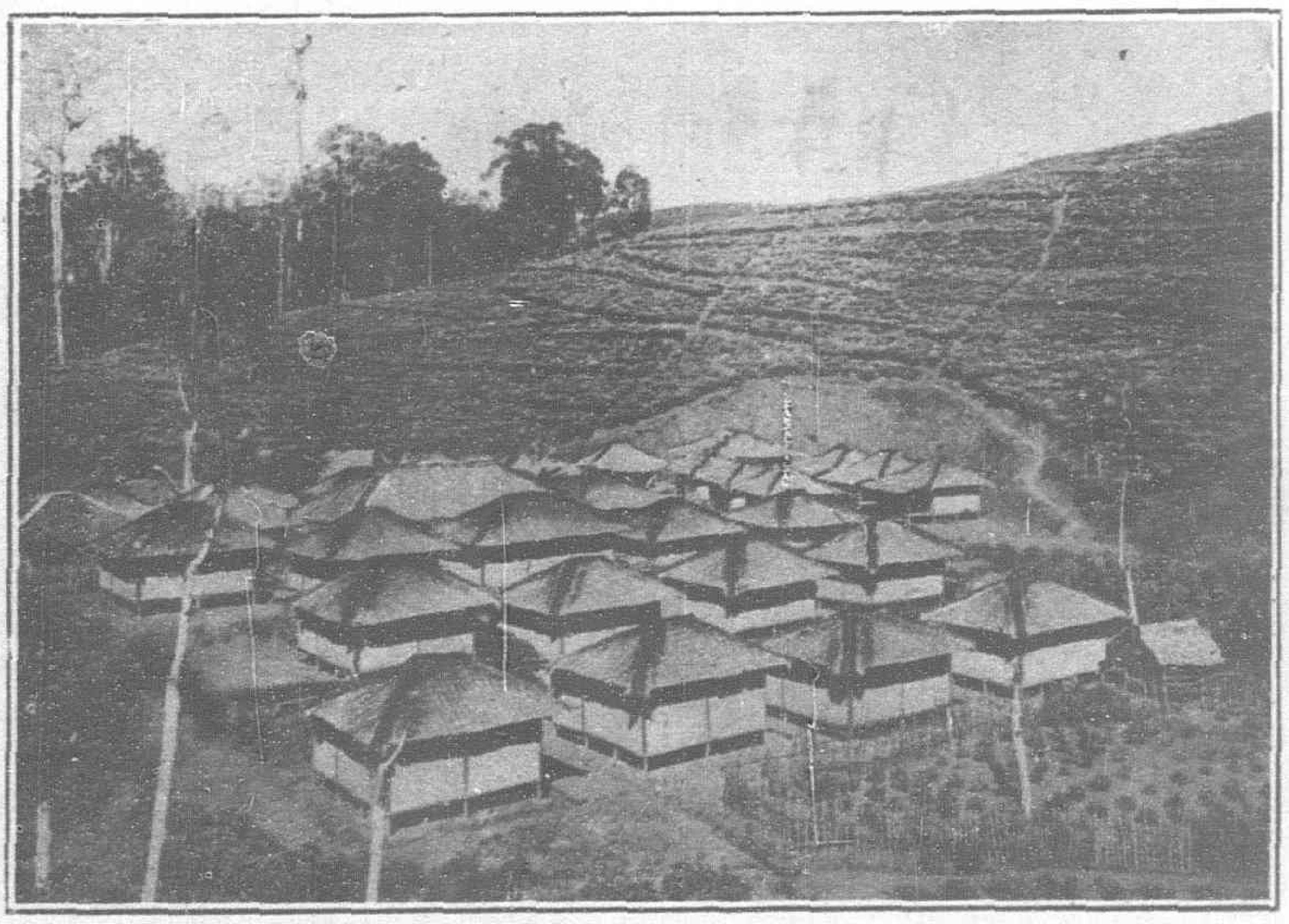
On high estates, where the nights are cool and where is often heavy mist, the chung is not practicable. Even in lower districts during the rainy season, when a great deal of leaf is brought in, the chung does not serve its purpose. To wither the leaf in the sun is out of the question, for not only would it thereby sacrifice a good deal of its quality, but the process takes place very irregularly, so that one is never sure of having sufficiently withered leaf in the morning, when the factory has to start work.

Artificial withering is, therefore, practised on a large number of the estates. It takes place in one, two, or even three lofts above the factory, or in a separate shed next to it. Here, too, spreading racks are arranged as in the chungs. They are placed back to back in pairs in a laterial direction with regard to the longitudial axis of the building. The lofts are enclosed on all sides. At one end openings are made connecting them with the factory, and at the other end are fans which, when set in motion, suck up the air so that a regular stream of warm air is brought from the factory and distributed over the tea leaf. It is the task of the factory employees to see that the stream of air is so regulated that it strikes the outspread leaf evenly and that, if necessary, it is kept at the right temperature by the addition of cold air.

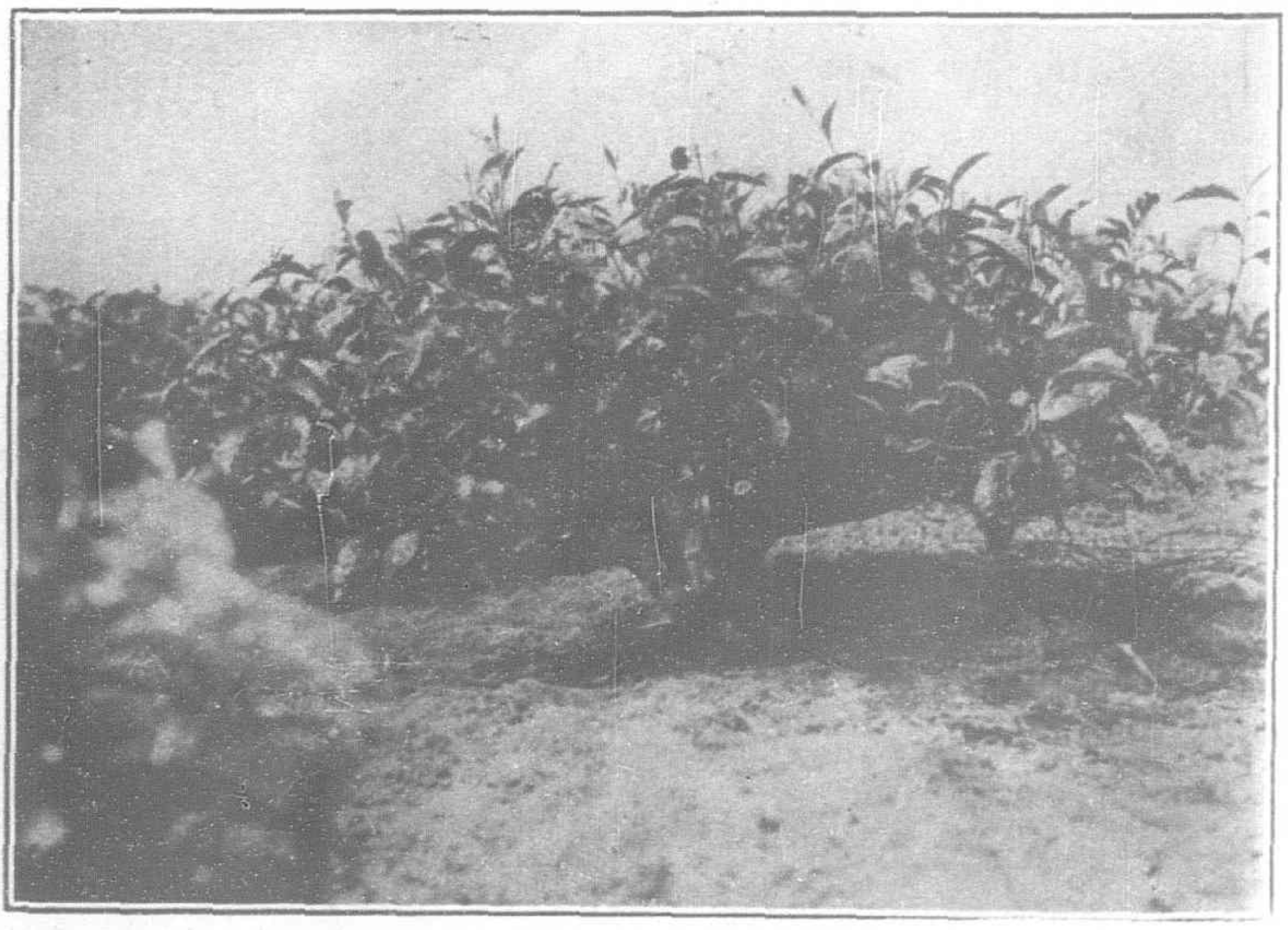
Another arrangement for artificial withering is the withering—box. This is an octagonal prism made of heavy wire netting which, placed horizontally, revolves about its longitudial axis. The axle is hollow and provided with small openings through which a stream of warm air is blown through the tea leaf as it revolves in the box.

Various contrivances have been invented for unloading the leaf from the shelves, when it has been sufficiently withered. With wooden shelves it is done very simply by brushing off the leaf. If this is not done too roughly it is a fairly useful method. Wiregauze shelves are slapped with the hands from below and this makes the leaf " jump " off, but some leaves always remain hanging in the meshes and these are sometimes damaged.

In the case of separate withering sheds the hot air is supplied by a separate air-heater, and it should be mixed first with ordinary outside air. If the mixing-room is sufficiently large, regular withering can be obtained, but if the hot and cold air are sucked over the leaf without thoroughly being mixed previously, the withering is bound to be very irregular.



Part of coolie-quarter on tea estate, Java



A tea shrub, seven years old, four months after the second pruning

The fans sometimes work all night, as long as is necessary to wither. For instance, when the leaf comes in at noon, the fans work from as soon as the leaf can be spread until six o'clock in the morning. This is, however, not possible on all estates, as water-power is not always available, and running the fans by means of steam-engines or oil-motors would be too expensive in most cases. In such a case the fans are run until eleven o'clock or midnight and then stopped. That this is not an ideal system of withering goes without saying.

When the leaf has been well withered, and has, therefore, become sufficiently supple, it is ready to be rolled. This process, which was formerly done by hand, serves not only to improve the appearance of the tea, but serves primarily to crush the leaf, causing the cell juices to mingle and consequently enabling them to act upon each other.

The rolling machines consist of a square or cylindrical receptacle, into which the leaf is thrown. The receptacle or "jacket" moves above the table, which movement effects the rolling of the leaf. In some systems of rollers the movement is confined to the receptacle (the "single action" rollers), while in others the receptacle is stationary, and the table moves.

In the "double action" rollers both table and receptacle move in opposite directions. These machines are now being used almost exclusively, the result being better. Receptacle and table are nearly always brasslined, as some aluminium-lined rollers were found to be unsatisfactory, while the old granite-faced tables are now quite obsolete. The centre of the table is fitted with brass battens, in order to assist the rolling process, and which allows the rolled leaf to drop out when it is desired to empty the roller. The top of the receptacle is formed by a movable cap, which can be made to slide down by turning a screw and in this way a certain pressure can be exerted, which is necessary to get a thorough mixing of the juices. In the case of treating course leaf this is very urgent. Some rollers lack this pressure cap and they are called "open-top" rollers, in which the necessary pressure for the leaf is obtained by its own weight. The pressure can be gradually increased, and now and then the cap is raised entirely, in order to cool the leaf.

A special system of roller without pressure-arrangement has a sort of screw or "plow," revolving in a stationary cylindrical jacket, the table also being stationary. The rolling is only effected by the screw, and it goes without saying, that the leaf is more broken than rolled. These machines are therefore very seldom used.

In the floor of the withering lofts holes are made with a tube running down to the rolling machine, through which this machine can be filled with leaf. About 330 to 440-lb. of withered leaf are rolled at one time by each machine.

The rolling is mostly done in two stages, sometimes in three, and the fine leaf is sifted out every time after rolling, the coarse leaf only being re-rolled. For instance, after filling, the leaf is rolled 15 minutes, without using pressure, then the cap is screwed down until it just touches the leaf, in which way the rolling is continued for 5 minutes, after which the cycle of operations is repeated. After sifting, the coarse leaf is rolled again, but now the pressure is increased.

The rolled leaf is dropped from the roller into a shallow flat-bottomed trolley which is placed under the roller, and in which the leaf is transported to the "ball breaker," consisting of a revolving drum-shaped sieve, or a flat shaking sieve, especially designed for the purpose. Here the finest leaf is separated from the coarser part. The coarse leaf is re-rolled until the desired result is obtained.

After all the leaf has been sufficiently rolled and sifted it is fermented. During the rolling the leaf has already begun to ferment a little, and this process must now be continued. In order that this may take place as well as possible the leaf is spread out to a thickness of about two inches in shallow trays consisting of a wooden frame with a bottom of bamboo wickerwork. These trays are put in rows one on top of the other, and after some hours (from 1½ to 4½) the tea is fermented. In order to keep the leaf sufficiently moist during the process, wet clothes are spread over the fermenting trays.

Sometimes fermentation is done on a floor covered with glazed tiles. The leaf is thereby spread out in a very thin layer, as otherwise the air cannot reach it sufficiently, and this is absolutely necessary. In other factories, fermentation is done in a separate locality, which is a very good system, because it admits of regulating everything properly. The atmosphere in the locality can be kept moist by running water along the walls, or by sucking the air through a curtain of falling water. It is then certain that the air is saturated with water and that no undue drying out of the fermenting leaf can occur.

As a result of the fermentation process various agents in the leaf mass, such as the tea ferment and the tannin under the influence of oxygen from the atmosphere, undergo a chemical reaction whereby the color of the leaf slowly turns brown and whereby the essential oil arises to which the tea owes its flavor.

The duration of the process depends upon various circumstances, A too long fermentation may result in an entire loss of aroma. The factory employees who have charge of this process notice from the color of the leaf mass and from the odor which arises, whether the fermenting process is completed. If this is the case, the product undergoes its final process, i.e. it is brought to the "sirocco" to be dried.

There are dryers of various construction in use, such as the updraft—, the downdraft—, and the auto-siroccos, or paragons. The main idea in all these is to let the drying process take place by means of a stream of hot air. In every type, therefore, is found a furnace, in which the air is heated, and a drying chamber with trays, on which the tea-leaf is spread in thin layers. The difference consists in whether the air is blown into the drying chamber from below or from above, and whether even drying takes place by turning the trays automatically or by hand.

In the older systems which are still in use, the trays consist of large square perforated metal plates, which are taken out two coolies from the bottom of the drying chamber and re-inserted at the top, in order to expose the whole bulk of leaf to the drying air. These machines have only a small capacity, but they are easily controlled.

In the newer systems the trays are continuous, and the leaf which is nowadays mechanically spread on the upper layer of trays, drops down on the next layer and comes out at the bottom partly or entirely dried, according to the system used: drying in two stages or in one only. The speed at which the trays move is regulated in such a way that the leaf comes out dried to the extent wished.

The large machines have a capacity of 200 to 300-lb. of leaf per hour.

The drying chambers are provided with side-doors which allow easy cleaning or repairing. Thermometers are fitted, but these are not always reliable, as they do not always show the exact temperature, and should, therefore, be replaced by self-registering temperature recorders.

In order to quickly cool the dried tea, it is sometimes placed in chests with perforated ventilating tubes which act as chimneys to carry away the hot air.

Attempts are continually being made to perfect the drying machines. There seems also to have been some idea of inventing a machine by which drying can take place in the open air. Since in this case the work can be done at a much lower temperature, it is highly probable that much more of the aroma can be retained.

After the tea has been dried it is called in Java "Factory tea," and now it is ready to be sorted. This is done by drum-shaped revolving sieves, or sometimes by more complicated sorting machines with shaking sieves. A very practical sorting machine is in use in Sumatra, in which the various grades of tea are finally sorted in one operation. The machine consists of a tea cutter and a series of sieves of various mesh. Also the tea is cut to a certain size by tea cutters.

Generally the tea is re-sorted by hand by women, who also remove the stalks, fibre, etc. This hand-sorting is done very carefully, especially in Java. In this way the suitable grades for the market are obtained, from orange pecoe to dust. The sorting is regulated according to the market, and not every factory makes the same grades.

The entire process of tea manufacture, from picking to and including sortation, takes place within a period of three days.

The sorted tea is stored in sinc or lead-lined bins, until it can be packed, which is generally done very soon.

The packing of Java and Sumatra teas is done in wooden chests lined with lead, or sometimes with tin, and containing about 100-lb. net. These chests are generally made in the factory, but nowadays various patent chests made of pressed three-ply wood (the so-called triplex chests) are also used extensively. They are much stronger and arrive ready-made at the factory.

The filling of the chests is done by the so-called packing-machines, which shake the tea down by a vibratory motion. The tea is put into the machine by means of a large feed-hopper.

Tea-presses are also used in order to get more tea into one chest.

After the tea-lead has been carefully soldered and the chests closed, they are transported by motor-truck or horse-cart to the nearest railway station.

Java and Sumatra teas are of very good quality, as shown by the prices obtained on the London and Amsterdam markets. They possess great variety of flavor and distinct characters of liquor. In the teas grown on the more highly situated estates, the lighter shades of ruby tints with the aroma and flavor of Ceylon teas are found. From other estates come teas the characters of which have developed directly from the Assam seed plantings from India. The teas grown on the estates on low ground are lacking in flavor.

Before the war, Java teas were hardly known in the United States of America, but when their import was prohibited in the United Kingdom, consignments were sent to New York, both of Java and Sumatra teas. After a time the quality of the tea sent fell off and it became less popular. Planters and shippers, seeing the mistake they had made, then became more careful as to the quality of their exports to North America, with the result that more tea from the Dutch Indies, particularly from Sumatra, was taken by the States.

Australia is another country increasing her imports of Java and Sumatra teas very rapidly during the last four years.

At the present time the demand for these teas is greater than it has been for some time past, owing very largely to buying from France and the Continent. Consumption in the U. S. A. and in Canada is said to have increased considerably. Stocks of leaf are lower than they were a year ago, and as there has been no increase in the output, it is anticipated that the demand will exceed the supply before long.

The following tables, showing the quantities of tea exported from Java and Sumatra during recent years, illustrate the significance of the industry for the world's tea trade :—

Unit : Kilogrammes.

Year.	Exports from Java.	Exports from Sumatra.
1918	28,115,000	2,388,000
1919	50,246,000	4,249,000
1920	40,670,000	5,130,000
1921	30,605,000	4,557,000
1922	36,688,000	6,765,000

Tin, The Cornerstone of Malaya

(Continued from page 27).

these lands. Under Malay rule they were subject to extortion under every petty Malay chief, but they kept at it in the face of difficulties and under hardships that probably would have daunted members of any other race.

The Chinese use old-fashioned methods but seem to be quite satisfied with them still. As one passes through the country he may see them industriously opening new mines, digging over old ones, sometimes working in great gangs of workers at other times with only a few and with a very simple outfit. Wherever you turn except in purely agricultural districts, you will see a new mine just opening, a mine in full swing, or one that has been abandoned, for there are very few places in this land of tin to which the Chinaman has not penetrated.

The greatest obstruction to tin mining is water which seeps into the mine hole and prevents the laborer from taking out the ore. The Chinese have a crude chain pump which they work by treading and this lifts the water at a terrific expenditure of human energy. Having only these crude implements for keeping their mines dry enough to work they manage to excavate to the depth of only thirty or forty feet. Within recent years modern pumps have been introduced operated by steam and these serve to make tin mining much more effective.

Not all the earth taken out of a mine is tin bearing ore. Much of it is overburden which has to be removed so that the tin-bearing ground can be gotten at. This is done either by manual labor, or, in the larger mines, by a system of trucks running on rails. The mine we saw was an open cast system of considerable size. Rails for hauling the ore and the overburden were laid at different levels and pushed by coolies in a circular route on the perimeter of the mine to a trellis where the car was hitched to a cable and pulled up a steam incline by a steam winch. This mine was kept dry by the operation of steam pumps working night and day to keep the surface water at a low level. Under this system the mine in the form of an inverted cone was being worked to a depth of about a hundred feet. The outside circumference was, in all probability, more than half-a-mile.

The ore was taken to a wooden flume which had slats or riffles nailed across the bottom. It was churned up by the feet of coolies while a stream of water played over it which carried off clay and the lighter substances leaving the tin which is heavier in the bottom. This was gathered into sacks and shipped to the coast where the smelters are located.

Recent developments have introduced modern improvements in tin mining. Bucket dredges have gone beyond the experimental stage as has also the use of monitors having nozzles that play a stream of water under five or six hundred feet of pressure upon the tin-bearing ground, with enough force to disintegrate it a consistency of thick mud. This is then passed over the riffles of an open flume and the tin is extracted as above described. The Chinese coolies are very adept at separating the tin from the ore and floating off the refuse.

Tin mining in the Federated Malay States is almost entirely confined to the alluvial deposits of the river valleys, or where the rock has disintegrated which allows for operation by some sort of placer method. I was told, however, that in the state of Pahang there are mines in successful operation which handle nothing but lodes.

The high prices of tin during, and immediately following, the world war led to extensive mining operations in other tin-producing countries. But in spite of competition from other quarters the Malay peninsula still boasts of being the greatest tin-producing country on earth.

Engineering Notes from Japan

The Kagamigahara corps of the Japanese air force expects to test a new 600 h.p. aeroplane motor in actual use, with its completion within a few months at the Nagoya Machine Manufacturing Company. This motor will be the first of its kinds in Japan, with plans and designs drawn by Japanese.

* * *

The Japanese government railways department has recently completed the Ohi wireless telephone station, and expects to start tantative operations soon with the running trains on the Tokaido line, so that the passengers will be able to send out messages while riding in a train. The despatch and receipt of wireless telephone messages will be made by means of antennae which will be fixed on the roofs of the carriages.

The Nagoya and the Kobe railway bureaus will have their wireless stations built during the next fiscal year, and, with their completion, the wireless telephone services will be opened the same as on the Tokyo Bureau section of the Tokaido line.

The Railway Department expects to spend about Y.50,000 for each of these wireless telephone stations, and Y.3,000 on for wireless telephone apparatus on the trains.

* * *

The Osaka Municipality, with a budget of Y.19,000,000, proposes to construct and rebuild 162 fire and earthquake proof bridges in the city, as part of the new city improvement project, which begins in 1924 and will be completed within ten years.

The new bridges will be either of reinforced concrete or steel and the present wooden structures will all be done away with. Of the 162, sixty of them will be rebuilt over the main waterways of the city, 83 over smaller branch rivers while the remaining 19 will be entirely new.

Indo-China Railways—2

Working Lines

Continued from December issue, page 745

TOPOGRAPHICAL DETAILS

THERE are 1,293 miles of railway in the union as shewn in the table below.

The first three group are run by the colony and the fourth by a private company.

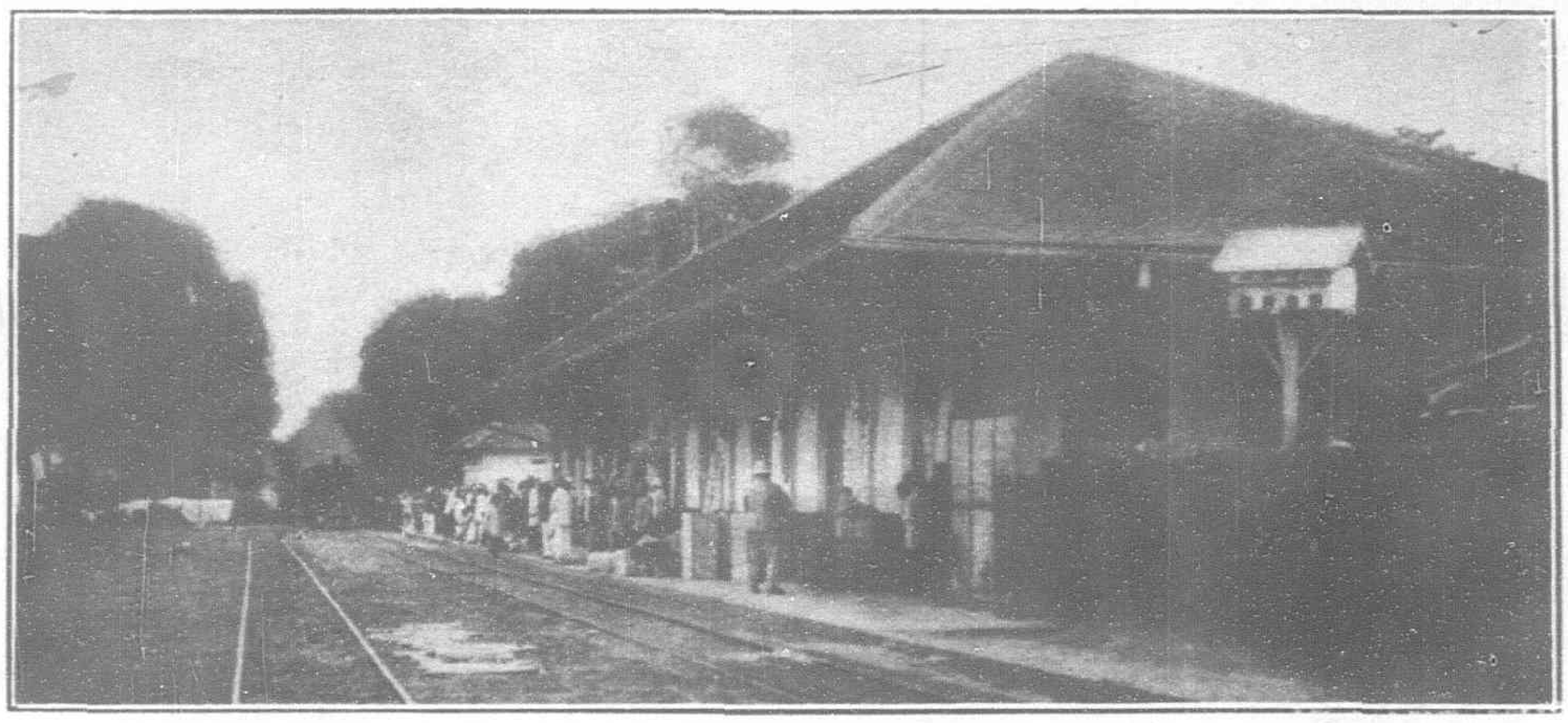
I.—Northern Group

1. HANOI TO NAM-KWAN

This line after leaving Hanoï crosses the Red River by a steel bridge, 1 mile and 77 yards long and runs through the paddy fields of the densely populated Tonkin delta by Bac-Ninh, Thi-Cau and Phu-Lang-Thuong to Kep (85 miles).

From Kep to Bac-Le the line follows the Song-Thuong river through a wooded and sparsely inhabited district.

From Bac-Le to Jiai it continues to follow the same valley, here much wider and more cultivated, between low bare hills on the east and the rocky mountains of Kai-Kinh on the west.



The Cholen Station on the Saigon-Mytho Railway

From Lang-Jiai the line takes on the character of a mountain railway and climbs through a wild and bare region to close to Langson where it enters the basin of the Song-Ki-Kung, a tributary of the Si-Kiang or Canton-river.

The last portion of the line runs through an easy and fairly rich and populated district.

Finally from Dong-Dang (3 miles before Nam-Kwan) a branch, 8 miles long, opened on November 15, 1921, runs to Na-Sham situated on a navigable reach of the Song-Ki-Kung. This branch is distinctly more important than that to Nam-Kwan and may be looked upon as the mainline.

Railways	Portions open to Traffic	Length miles	Remarks
I Northern Group ..	Hanoi to Na-Sham, 114 miles Hanoi to Vinh, 202 miles	317	
II Central Annam Group ..	Turan to Hue, Kwangtri and Dong-Ha	109	
III Southern Group ..	Saigon to Mytho, 43 miles Saigon to Nha-trang, 290 miles	333	
IV Cie Fse des Chemins de fer de l'Indo-Chine et du Yunnan ..	Haiphong to Lao-kai and Yunnan-fu	534	of which 289 miles are in China, north of Lao-kai

2. FROM HANOI TO VINH

From Hanoï this line crosses the delta of the Red River by the native towns of Phu-Li, Nam-Dinh and Ninh-Binh and reaches the Tonkin frontier at Bim-Son, 88 miles away.

At 109 miles it reaches Thanh-Hoa the capital of the province of the same name and still in a delta country, whence, following the coast, it runs into the delta of the Song-Ka and reaches Vinh, 199 miles from Hanoï.

The whole of the district through which this line runs, with the exception of between Ninh-Binh and Thanh-Hoa, is composed of the deltas of the Red River, the Song-Ma (Thanh-Hoa) and other small rivers and the Song-Ka (Vinh). It is a great rice-growing country peopled by Annamites and on the whole fairly prosperous, and is even remarkably so in the Tonkin section. As may be expected the line is pretty level.

The present terminus at Vinh is also connected by a 3-mile branch running along the river to the port of Ben-thui on the estuary of the Song-Ka. This port may become some day of importance when the proposed roads and railways connecting it with Laos and the plateau of Tran-Ninh have been materialized.

II.—Central Annam Group

The one and only railway in this group runs from Turan, the chief port of Central Annam, by the royal city of Hue (64 miles) and the capital of the province, Kwang-tri (99 miles), tc its present terminus et Dong-Ha (109 miles from Turan).

Topographically it may be divided into two distinct sections. The first, up to 31 miles from Turan runs through a hilly and sparsely populated region where the line is very devious and abounds in constructive works. In the second section the line passes through or near level country by the sea which, without attaining the prosperity of the rich lands of Cochin-China or of the Tonkin delta, is yet fairly well populated.

III.—Southern Group

1. SAÏGON TO MYTHO AND CHOLON

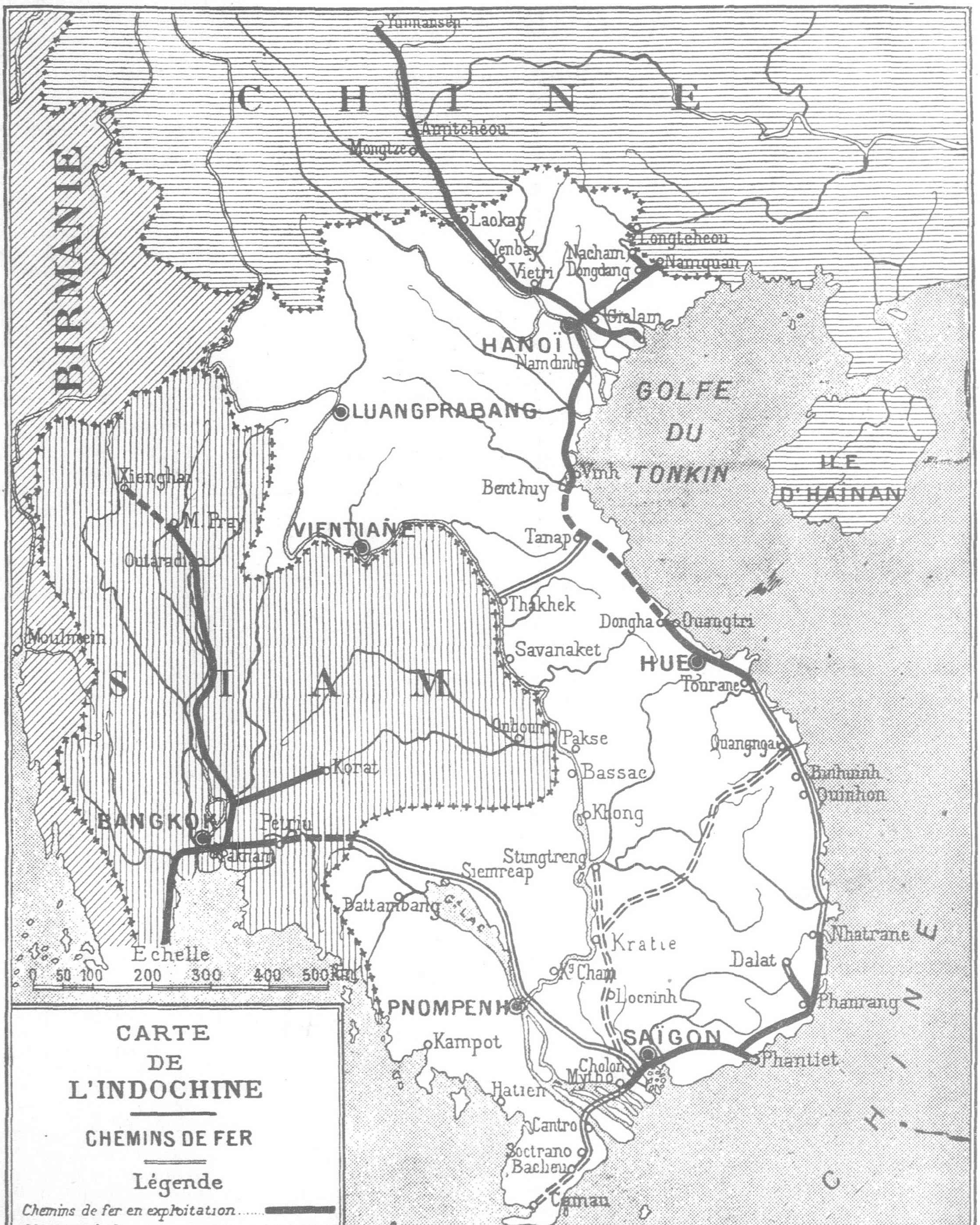
This railway, running through a populous part of Cochin-China, linking up two important towns and finally passing through the Chinese city of Cholon, has by far the most dense traffic of all the railways of the colony.

As it crosses a country cut up by large rivers it contains important metallic structures, built under difficult conditions owing to the nature of the ground.

2. SAÏGON TO NHA-TRANG

From Saïgon this railway runs up the valley of the Saïgon river, which it crosses at Bien-Hoa, through a fertile and well populated level country. Soon after leaving Bien-Hoa it runs over the low but densely wooded spurs from the Annamite mountain-chain, and approaches the coast at Muong-Man, from whence runs a branch to Phantiet, a fishing port and trade centre on the delta of a small river. Thence it follows the coast cutting the mountain spurs separating the valleys of the little coastal rivers, past Phan-ri, Phan-rang (station for Tur-sham) and Kam-Ranh to Nhatrang.

From Tur-Sham a branch, of which 25 miles are already constructed, runs to Krong-Pha and will be prolonged up to the Lang-bian plateau.


CARTE
DE
L'INDOCHINE
CHEMINS DE FER
Légende
Chemins de fer en exploitation
Chemins de fer en construction
Chemins de fer projet 1re Urgence
2e Urgence
Echelle
0 50 100 200 300 400 500 Km
Jacobé del.
CHINE
BIRMANIE
SIAM
GOLFE DU TONKIN
ILE D'HAINAN
MER DE CHINE
Yunnansen
Amitchéou
Mongtze
Laokay
Yenbay
Vietri
Nacham
Dongdang
Longtcheou
Namquan
Gialam
HANOÏ
Namdinh
LUANGPRABANG
Vinh
Benthuy
Tanap
VIENTIANE
Thakhek
Dongha
Quangtri
Savanaket
HUE
Tourane
Xienghai
M. Prey
Outaradit
Moulmein
Onboun
Pakse
Bassac
Korat
Quangngai
Bonhunh
Quinhon
Khong
BANGKOK
Petriu
Paknam
Stungtreng
Siemreap
Battambang
Grand Lac
Kratie
Nhatrane
Dalat
Kg Cham
Locninh
Phanrang
PNOMPENH
SAÏGON
Kampot
Phantiet
Cholon
Mytho
Hatien
Cantro
Soctrano
Bacheu
Camau

The whole district from Bien-Hoa, including the deltas, is barren. Irrigation works, plans for some of which are already being made, utilization of the forests and increase in the rubber plantations will alone make this line pay sometime in the future.

The lay-out of the line presented no serious difficulty as the spurs of the Annamite mountains could be crossed by easy gradients.

IV.—The Yunnan Railway

This railway which runs from Hai-phong, the great port of Tonkin, for 534 miles to the capital of the Chinese province of Yunnan may be topographically divided into four parts :

The delta of Tonkin,
The valley of the Red River,
The valley of the Nam-Ti, and the Yunnan plateau.

The delta of Tonkin, which is crossed from Hai-phong to Vietri has the characteristics already indicated, viz ; an agricultural country, densely populated and rich. The line runs by the towns of Hai-duong and Jialam (61 miles) where the trains coming from Hai-phong branch off to Hanoï, jointly utilizing for 2½ miles the metals of the Hanoï and Nam-Kwang line ; from Jialam it runs on to Vietri (102 miles).

From Vietri to Lao-kai (242 miles) by Yen-Bai the railway follows fairly closely but without difficulty the windings of the Red River along a narrow and sparsely inhabited valley.

The Station at Mytho

From Lao-kai to the pass of Milati the rails, now in Chinese territory, run up the valley of the Nam-Ti, a tributary of the Red River, and crossing the pass (339 miles) at a height of 5,577 feet attain the Yunnan plateau. The whole region is wild and unhealthy, and the building of the railway was exceedingly difficult owing to this and to the nature of the soil.

From the pass the line descends by a gradient averaging 1 in 62 to the important station of Pi-che-shai (352 miles) in the Mong-tzu district with its tin mines at Ko-Kiu. Soon after passing A-mi-chu (379 miles) it enters the valley of the Pa-ta-ho and runs up it to Yi-liang.

From this town the railway rises rapidly by an average gradient of 1 in 40 to Shue-Tang (480 miles) where it reaches the upper Yunnan plateau, whence, through an almost level country, it reaches its terminus at Yunnan-fu (530 miles).

This last section—more especially close to Yunnan-fu—runs through a generally fertile and populous country thus assuring an important traffic.

II.—Constructional Details

1. EARTHWORKS, ETC

The gauge of the Indo-Chinese railways is 1 metre (3-ft. 3⅜-ins). This is considered more than sufficient to meet all possible traffic requirements for many years to come.

Gradients never exceed 1 in 40 and the radii of the curves are never less than 100 metres (5 chains).

2. PERMANENT WAY

A. *Rails.*—The steel Vignole rails are laid on broken stone ballast 19⅝-in. thick and 8-ft. 2½-in. wide on top. They are from 26-ft. 3-in. to 39-ft. 4-in. in length and weigh, according to type, from 13.4 to 18.1-lb. per foot run.

Fish-plates.—The fish-plates, generally of a current type and weighing from 12.1 to 13.2-lb., are attached to the rail by 4 bolts in a single row.

Sleepers.—These are of metal on the Yunnan line and on part of the other railways, and have given entire satisfaction. It is too soon, however, to fix the length of their life.

In the other parts of the colony, and especially in the forest regions, the sleepers are of wood as their first cost is much lower. They are cut from Lim, nghien and sao trees and are generally 5-ft. 8⅞-in. by 7-in. by 4¾-in. and spaced fairly close together. The rails are coachscrewed direct on to them without any sole-plates.

Signals. The Lines are all single and the traffic easy, so that signals and signal regulations—of the usual French type—are minimum.

B. *Buildings.*—The smaller stations are provided with but one building for both passengers and goods, and the line is doubled and has a lay-by siding as well. The more important stations are provided with various types of buildings.

Over the greater part of the railways there has been no difficulty in supplying water, which has to be nearly always pumped.

C. *Gatekeeper's* lodges and living-quarters for staff outside towns and villages there are but few busy roads to be crossed on the level and therefore there has been little need to provide gatekeeper's houses. On the other hand many stations have special quarters for Europeans and for natives.

D. *Fencing.*—This is provided solely in the stations and in certain towns and villages, all the rest of the line being left open.

Equipment

ROLLING STOCK*

1. *Locomotives.*—The most usual type of locomotive is a 4-wheel coupled weighing empty about 30 tons (1 ton × .984 tons), and capable of hauling 200-ton passenger trains at 25 miles an hour or 300-ton goods trains at 12 to 16 miles an hour.

More powerful locomotives—8-wheel coupled and 40 tonnes adhesion—are used on the long 1-in. 40 gradients of the Yunnan railway.

The proposed Langbian railway will be worked partly by adherence and partly by rack.

Coal is exclusively employed in Tonkin and Yunnan, where this combustible extracted locally, is cheap (from $10 to $15 per ton according to quality). This is supplied chiefly from the collieries of Hongay (a non-bituminous coal), of Phan-Me, in the Thai-Nguyen district, and of Phu-Nho-Kwan to the west of Ninh-Binh. These two latter produce a good bituminous coal.

The Central Annam and southern groups having to obtain their coal from Tonkin, use wood as well, as it is cheaper. The only coal that Tonkin exports is in the form of briquettes from Hongai which cost in September, 1921 $30 per ton delivered at Saïgon, and about $27 at Turan, whereas wood was from $3 to $4.50 per ton.

2. *Passenger Stock.*—With the exception of the Saïgon and Mytho line there are four classes; first and second-class are generally combined to form a mixed carriage, but the most usual type—known as A.B.C.—has 2 first-class, 2 second-class and 4 third-class compartments. There are of the corridor type with seats running across the carriage. There are a few carriages entirely third-class. All the above are used by both Europeans and natives.

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*The rolling-stock of the colony is fairly homogenous at the present time, except on the Saigon and Mytho railway, which is of much older construction and where the loading gauge is smaller, the curves of smaller radius and the constructive works built for lighter loads. It therefore has special material, and locomotives and trucks weighing empty over 5 tons from the other railways cannot be run over its lines.

The fourth-class is reserved for the latter and the carriages have seats along the two sides, the centre being free for luggage, such not being carried in the van.

All passenger stock runs on bogies and weigh each about 16 tons.

3. *Goods Stock.*—This is all of the type usual on metre gauge railways and calls for no special remark.

4. *Fixed Works.*—This too calls for no special remark, each group being fitted up on normal lines.

5. *Repair Shops.*—The colonial railways have shops for erecting and repairing, but not for construction, as all metal parts are received from Europe as a rule fully machined. Joinery and body-work, however, is done in the colony.

List of repair shops.

Group	Chief Repair-shop	Branch Repair-shops	Remarks
Northern ..	.. Truong-Thi (1)	Hanoi	(1) 1 mile from Vinh towards Benthuy.
Central Annam	.. Turan	Hue	
Southern ..	.. Dian (2)	Saigon	(2) Between Saigon and Bien-Hoa.
Yunnan ...	... Jia-Lam	Lao-kai- Amichiou Yunnansen	

Management

1. COLONIAL RAILWAYS

Each of the three sections is under a chief sectional engineer and forms a distinct management under the engineer-in-chief, who is directly under the orders of the inspector-general of public works in Indo-China.

A small staff of French directs the native station-masters, inspectors, trainmen, engine drivers, shop workmen, etc.

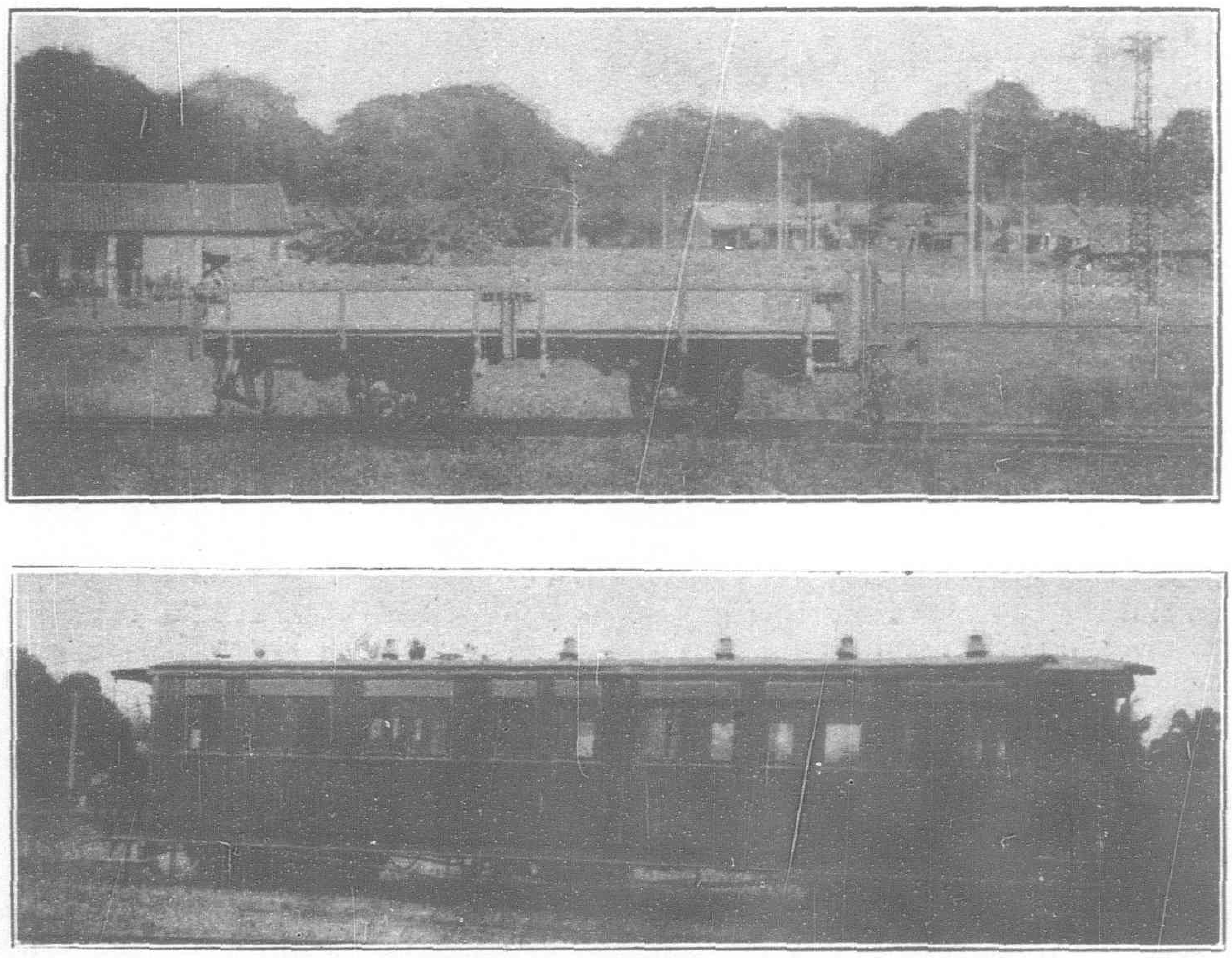
The finances of the railways are governed by the interministerial order of February 17, 1914 and are as follows:

Every year a railway budget is established outside the normal budget. Its sole receipts are those that it earns.

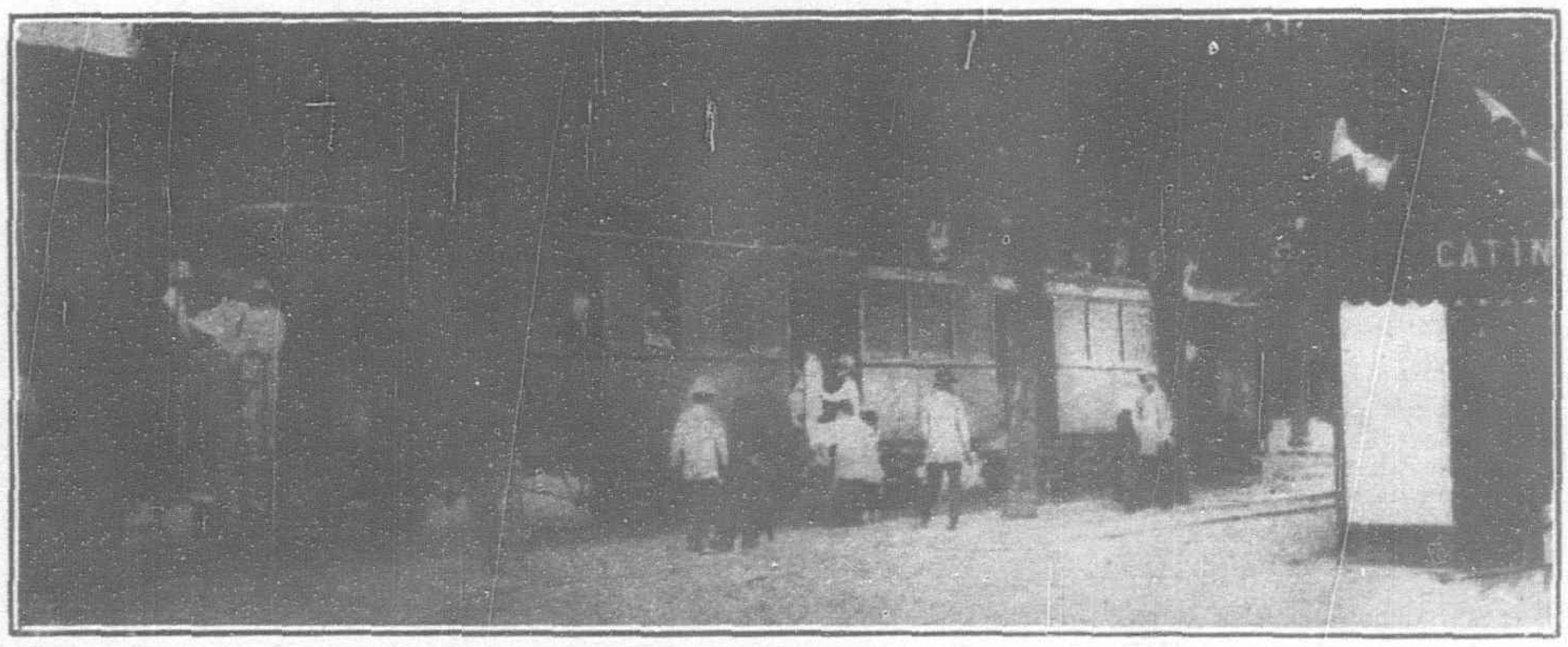
Besides this, three funds—also outside the normal budget—have been created:

1. A rolling fund consisting of materials and money sufficient to meet the current requirements of the running department. This forms a stores department, everything being obtained through it.

2. A special fund for supplementary works and supplies, out of which are met the cost of all new or extraordinary work, such as renewals and improvements.



Types of Rolling Stock on the Saigon-Mytho Line



Tramway Station at Govap, Cochin-China

3. A reserve fund to cover the deficit in receipts in bad years.

These three funds were created at the start by loans from the reserve fund of the general budget. In normal years this system works as follows: the reserve fund remains untouched; the stores department, whose payments are all in cash, keeps a stock of stores and money of practically unvarying value while the special fund, out of which extraordinary expenses have been met during the year, is fed by a portion of the year's receipts, the other portion going to the reserve fund.

2. YUNNAN PRIVATE RAILWAY

The management of this line does not essentially differ from that of the colony's own lines, natives being employed as far as possible under the guidance of a few Europeans.

Its finances are regulated by an amendment to the agreement dated July, 1920, whereby the colony undertakes to re-imburse all expenses incurred by the Company for improvements in the maintenance and running of the railway. Before the application of this amendment, which is of five years' duration, the Company's expenses were covered by a system of fixed charges, but this had to be abandoned on account of the varying economic values due to the war. It will probably be re-established at the expiration of the present system, but naturally in a form to meet existing economic conditions.

In both cases, by fixed charge or by direct re-imbursement of expenses incurred, all net running receipts are devoted, first, to meeting certain of the Company's expenses (capital charges and expenses of the central management, etc.) and secondly, what is over divided between the colony and the Company in accordance with the terms of the concession.

Traffic Results

Each year the inspector-general of public works of the Colony issues statistics showing how the railways have been run, the nature of the traffic, etc., from which the following notes on the special trade of Indo-China have been taken.

1. PASSENGER TRAFFIC

LOCAL CHARACTER OF NATIVE TRAVEL

As will be seen from the figures given later on, native passenger traffic forms an important item in the receipts.

With the exception of the portion of the Yunnan railway in Chinese territory, the only railways that cover their expenses are those in the deltas of Tonkin, Northern Annam and Cochin-China. These districts are peopled uniquely by Annamites, living for the most part on the cultivation of rice and a few home industries, but generally without commercial instinct.

This extremely dense population (over 777 to the square mile in certain districts) quickly took to the railway and forms actually, a very important class of passenger, but the Annamite, like most peasants, sticks to his native village. It is exceedingly difficult to make him leave his delta for higher districts or to get him to undertake any sort of work, whether trade, industry, husbandry or public works outside his chosen home. He takes the train, therefore, solely to go to market in the nearest town or village where he sells his produce and purchases a few indispensible necessaries, and very rarely undertakes a long journey.

2. TRAFFIC IN LOCAL PRODUCE AND GOODS OF CURRENT CONSUMPTION

For these same reasons and because the produce of each delta, on which the Annamite is contented to live, is practically the same, there are very few long hauls of goods on the railways.

3. GOODS FOR EXPORT. COMPETITION OF WATER-CARRIAGE

Sometimes, however, there is a fairly considerable surplus of rice for exportation. The exportation of wood is also well developed.

But the handling of these goods as well as of coal, lime, cement, bricks, etc., is much more cheaply undertaken by water (rivers and sea) and seeing that the railways, as is usual in new countries, generally follow a river or the coast, such competition is fatal to them.

4. IMPORTED GOODS

These are handled by the railways, but their volume is still very small as may be expected where industry is just beginning and local customers are not exacting as regards foreign goods. The importance of the traffic to Yunnan in metal goods and in cotton tissues may, however, be noted.

The above reasons suffice to explain the local character of the traffic and the absence so far of long hauls such as might have been reasonably expected. These latter are, however, quite, within the bounds of possibility after the railways have been extended and have placed new and suitable countries within reach of the Annamite population and when industrial enterprises have multiplied. It is quite conceivable, too, that the drainage works of Cochin-China will in due time increase the available land for culture and that the Trans-Indo-China railway, when completed, will bring abundent labour from the less favoured lands in the north.

The Annamite dreads voyages by sea more than those by land, and it is more than likely that, when the population eventually make up their minds to undertake long journeys, the railways will have the preference.

Traffic Statistics

Passengers

In 1920 the railways of the Colony transported 11,500,000 passengers, including 10,900,000 natives, the receipts for which were 5,000,000 piastres, half of which was received from the natives. These figures have been steadily increasing since 1915, when the existing railway system was practically completed.

The following stations show remarkable annual returns for a colonial railway: Hanoï with 2,660,000 passengers yielding $428,000 ; Haï-phong with 800,000 and $106,000 Saïgon with 642,000 and $193,000 ; Hai-duong with 619,000 and $40,000 ; Yunnan-fu with 593.000 and $70,500 and Mytho with 350,000 passengers and $157,000 of receipts.

Goods

In 1920 767,000 tonnes of goods were transported bringing in $2,830,000.

The most important goods stations are : Hanoï with 175,000 tons yielding $352,000 ; Hai-duong with 72,000 and $346,776 ; Saïgon with 123,000 and $100,000* ; Yunnan-fu with 49,000 tons and $259,172 of receipts.

The only goods calling for remark are metal goods and textile tissues on the Yunnan railway, which yield respectively $248,000 and $237,000.

Running of the Trains

As a rule the commercial speed of passenger trains rarely exceeds 15 to 17 miles per hour, and that of mixed trains is about the same, while goods trains travel at about 12 miles per hour.

With the exception of the service between Saïgon and the sanatorium of Langbian and of a daily train between Hai-phong and Hanoï (from 7 to 10 p.m.) all trains run only during the day.

Railway Finances

The total capital invested by the colony in its railways is :

In the railways run by the colony	182,582,973 francs
In the Yunnan private railway	243,068,423 —

The curves given in the appendix show, for the period from 1915 to 1920 inclusive, the general results of the running, the receipts, expenses, etc. for the above two sets of railways.

It will be seen that the net receipts have steadily increased from 155,000 piastres in 1915 to over 400,000 in 1920, showing a very satisfactory development.

Nevertheless the average receipts have never been sufficient to cover running expenses and capital charges. This balance is naturally largely affected by the value of the piastre. It would, however, be a mistake to judge of the value of the railways solely from their balance sheets, for the railways are of considerable commercial importance and, as is equally the case with the roads, contribute to the development of the wealth of the colony.

Further, the railway system is by no means complete. Most of the existing lines are but a part of an as yet unrealized whole and when they are all connected up there is no doubt but that the traffic will be more than correspondingly increased.

Let us examine, for example, the end section of the Hanoï and Vinh railway from Than-Hoa to Vinh. Its local traffic in 1920 amounted to $1,181 per mile, an extremely low figure and comparable with that of the lowest section of the present system, viz that from Turan to Dong-ha ($1,224) which is actually the line the smallest earnings. Since it has been connected up with the railways of Central Tonkin its receipts have, however, attained $4,272 per mile, thus almost equalling the general average.

Furthermore, the present railway system is by no means complete and the following lines are either being constructed or planned for. In construction : the 162 mile long railway from Vinh to Dong-ha which will connect the system of North and Central Annam and thus complete the first half of the Trans-Indo-China trunk line. The work is being actively pushed forward and a part of the cost is being defrayed out of the $6,000,000 loan which has recently been floated, and which met with such signal success among the natives. Proposed : at the same time plans are being prepared for new lines in the south which will fill up the gaps of the Trans-Indo-China main-line between Turan and Nha-trang on the east and Saïgon, Phom-Penh and the Siamese frontier on the west. On the completion of these lines together with another to be carried out by the Siamese government and connecting Bangkok with the Cambodia frontier, it will be possible to go entirely by rail from Yunnan-fu in China to Bangkok in Siam via Hanoï, Hue, Saïgon and Pnom-Penh in Indo-China.

(To be continued)

Tokyo Buys 400 New Street Cars

The Tokyo electric bureau is planning to order about 400 street cars from Nagoya. It is expected that the total number of street cars at the end of March will be about 1,200, and the congestion greatly alleviated.

At present, there are about 800 street cars operated in Tokyo. Jitney automobiles will be commenced to be operated on or about January 15 in Tokyo.

Before the earthquake, there were about 1,350 street cars operated in Tokyo.

The authorities will also order 1,000 automobiles to relieve the existing congestion; 300 automobiles have already been unloaded at Yokohama and 300 drivers have received licences from the metropolitan police board.

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* Saïgon is placed low in the list of important stations as all the richest lands near-by and in the hinterland of Cochin-China are connected to it by many excellent waterways, but in few cases by rail.

Reinforced Concrete Freight Cars

Experiments and Designs—Reinforced Concrete Cars are Heavier but Cheaper than Cars made of Iron

By Professor Dr. Ing. Kleinlogel, Darmstadt

THERE can be no doubt about reinforced concrete being generally a suitable material for constructing railway cars. The good qualities of reinforced concrete have been established for many years, i.e., large capacity, rust and fire proofness, small wear and low maintenance costs. Especially the rust proof feature is of particular economic importance in consideration of the great losses experienced on account of the material rusting.

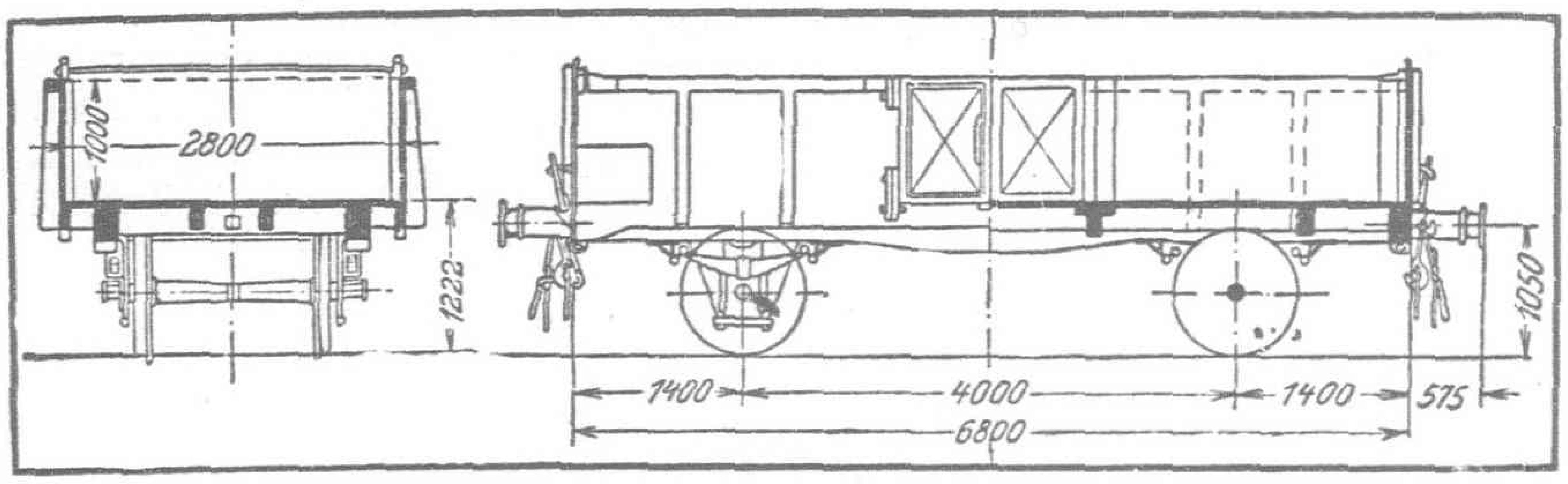


Fig. 1.—Sketch of a 15-ton reinforced concrete car

It is very difficult to make a statistical calculation of the reinforced concrete car due to the fact, that the forces manifested according to position, size, direction and performance are not given, but must be ascertained from observations, approximative calculations and by experiment. To obtain definite figures, so-called buffer stop experiments were undertaken, druing which the forces manifested were measured with great approximation, and the effects of these forces on the reinforced concrete constructions could be ascertained to a degree which provided sufficient clearness. The successful carrying out of the experiments was to a large part due to the praise worthy participation of the Wagon Factory H. Fuchs, Heidelberg.

The very valuable results gained by these experiments provided for the necessary confidence to start constructing the first reinforced concrete car. This was a 20-ton coal car built for the use of the Portland Zementwerke of Heidelberg, Mannheim and Stuttgart. It has now been in service for a long time without giving rise to complaints of any kind. About the same time the Wagon Factory H. Fuchs constructed a 15-ton freight car of the standard open type. This car was submitted to the inspection of the freight car committee of the German states railways, which unrestrictedly approved of the pleasing appearance, construction and equipment. This car was then, at the end of May, 1920, used for making extensive experiments both as regards the resistive power of the fastening of the trimmings in the concrete, and the resistive power of the construction against the shocks and jars it would be subjected to during shunting. The trial car was run with speeds up to 21 kilometres an hour into stop blocks placed on one rail and also into iron cars placed in its way. It was then every time subjected to a careful and thorough examination. During the first experiments, the car was run empty, afterwards it was loaded with 17 tons of ore. The shock was sometimes so tremendous that it could be heard for miles. Notwithstanding, the reinforced concrete frame stood the tests admirably. No alteration in the condition of the fastenings and no crack in the construction could be ascertained.

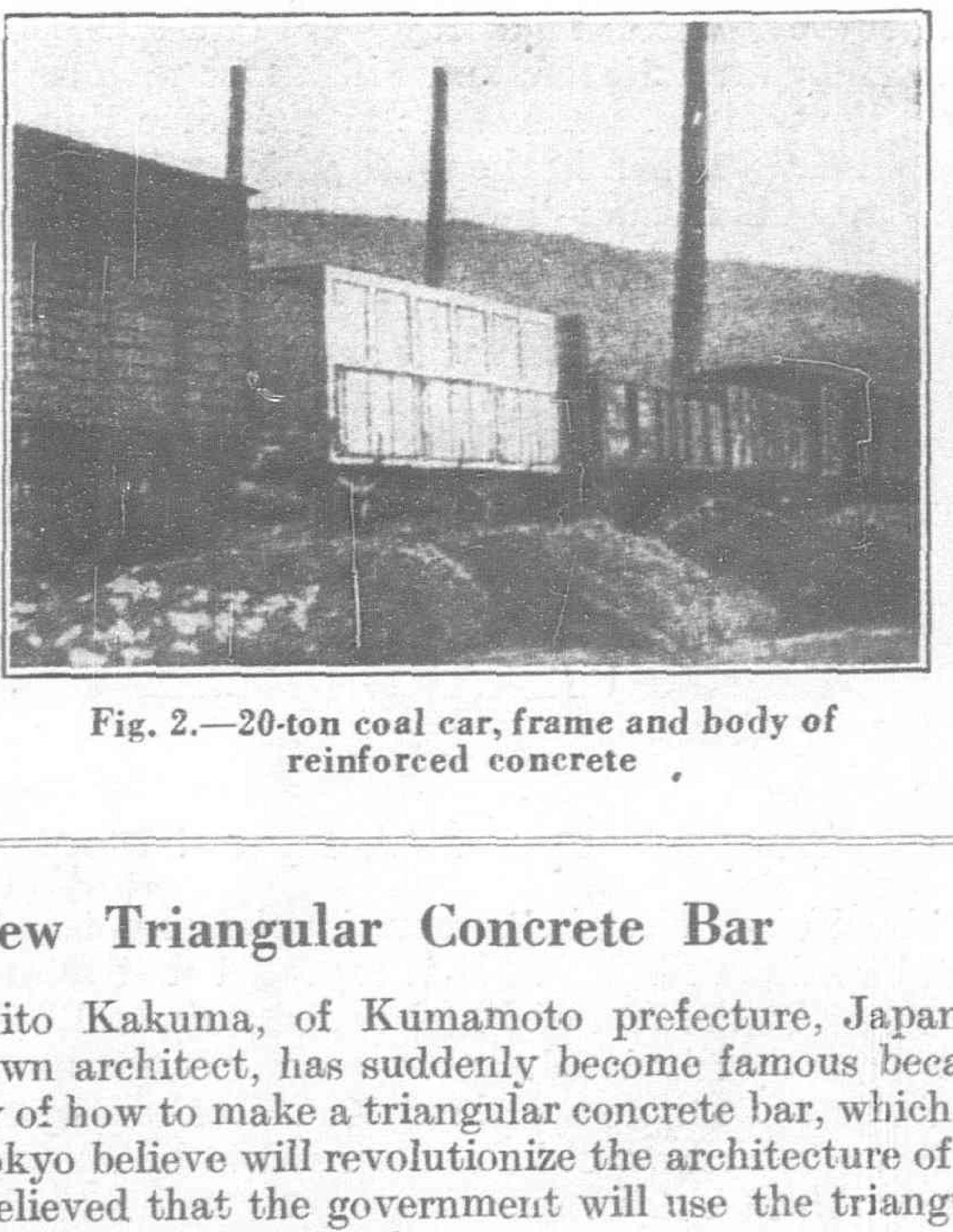


Fig. 2.—20-ton coal car, frame and body of reinforced concrete

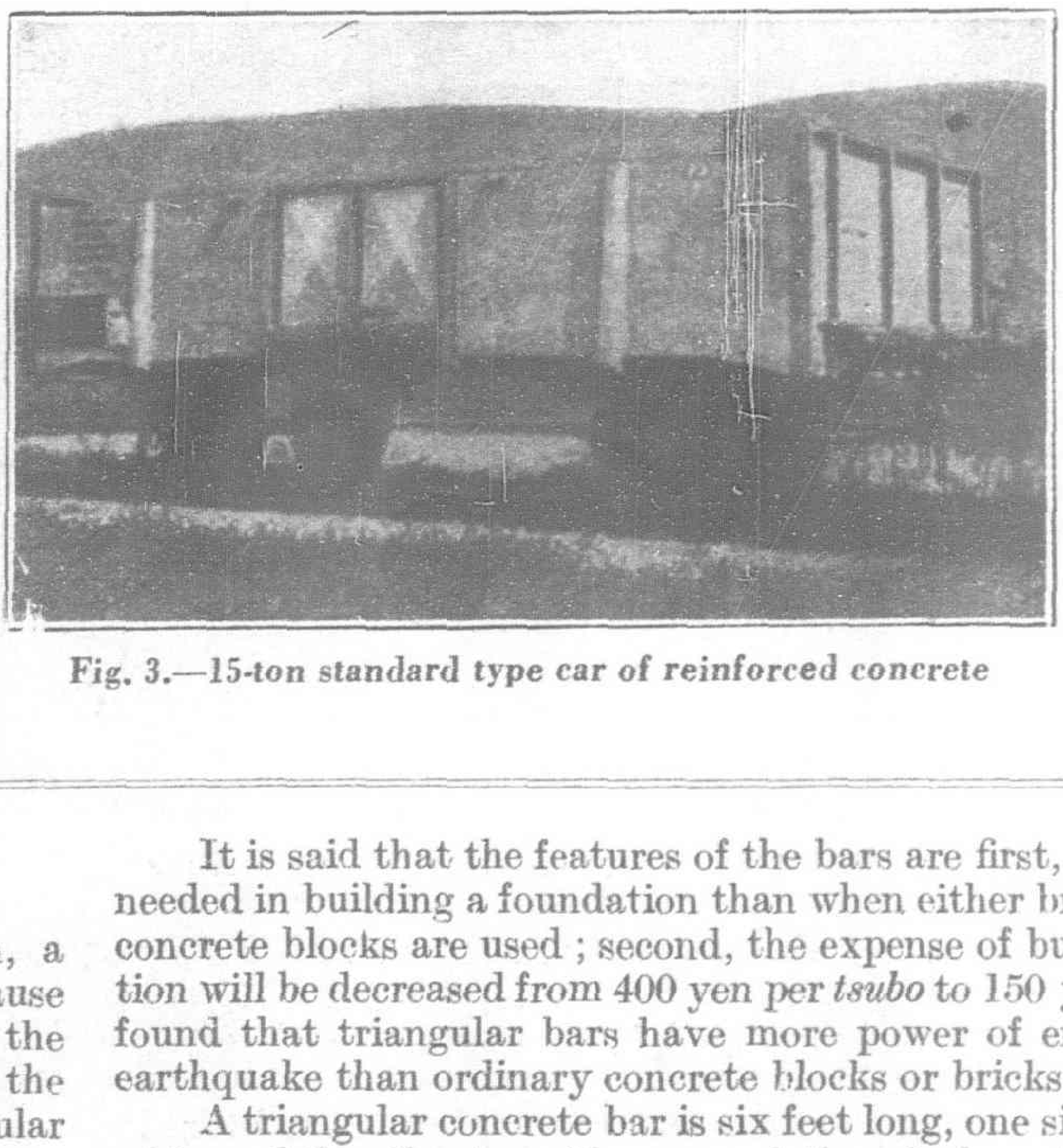


Fig. 3.—15-ton standard type car of reinforced concrete

In the meantime different types of reinforced concrete cars have been constructed, and numerous cars of the trial car type, which had been so well tested, were built.

Naturally, the dead weight of the reinforced concrete car is somewhat greater than that of the iron car, but this will prove to be the only disadvantage of the new type of cars, a disadvantage that will hardly ever be completely eliminated. On the other hand, the reinforced concrete car runs much steadier than the iron car and the essential fact is that all experience tends to show that the wear of these cars is a minimum, and that there is no danger of rusting. The result is that maintenance costs are kept inside very low limits and furthermore that the iron concrete car will *always* be *cheaper* than an iron car of the same capacity and design.

New Triangular Concrete Bar

Mr. Hirohito Kakuma, of Kumamoto prefecture, Japan, a hitherto unknown architect, has suddenly become famous because of his discovery of how to make a triangular concrete bar, which the architects of Tokyo believe will revolutionize the architecture of the world. It is believed that the government will use the triangular concrete bars in the restoration work.

Mr. Kakuma is 31 years old, and has recently gone to Tokyo from his native town in Kumamoto prefecture in order to demonstrate the usefulness of his discovery. Since his arrival, he has commenced the foundation work of a Methodist church of Nakano, Tokyo, and of other new buildings.

It is said that the features of the bars are first, less time will be needed in building a foundation than when either bricks or ordinary concrete blocks are used ; second, the expense of building a foundation will be decreased from 400 yen per *tsubo* to 150 yen ; it has been found that triangular bars have more power of endurance for an earthquake than ordinary concrete blocks or bricks.

A triangular concrete bar is six feet long, one side is four inches wide, and the other two sides are each three inches wide, a triangular steel bar making the core. The labor required when the triangular bars are used is only one-fortieth of the labor required when bricks are used, and one-fourth of that required for ordinary concrete blocks.

Mr. Kakuma is planning to popularise the use of triangular bars by producing them at 50 sen each.

Shipping Locomotives from the Tyne

BY the courtesy of Sir W. G. Armstrong, Whitworth & Co., Ltd., we are enabled to publish two photographs of unique interest showing the method adopted by this firm for shipping locomotives to India.

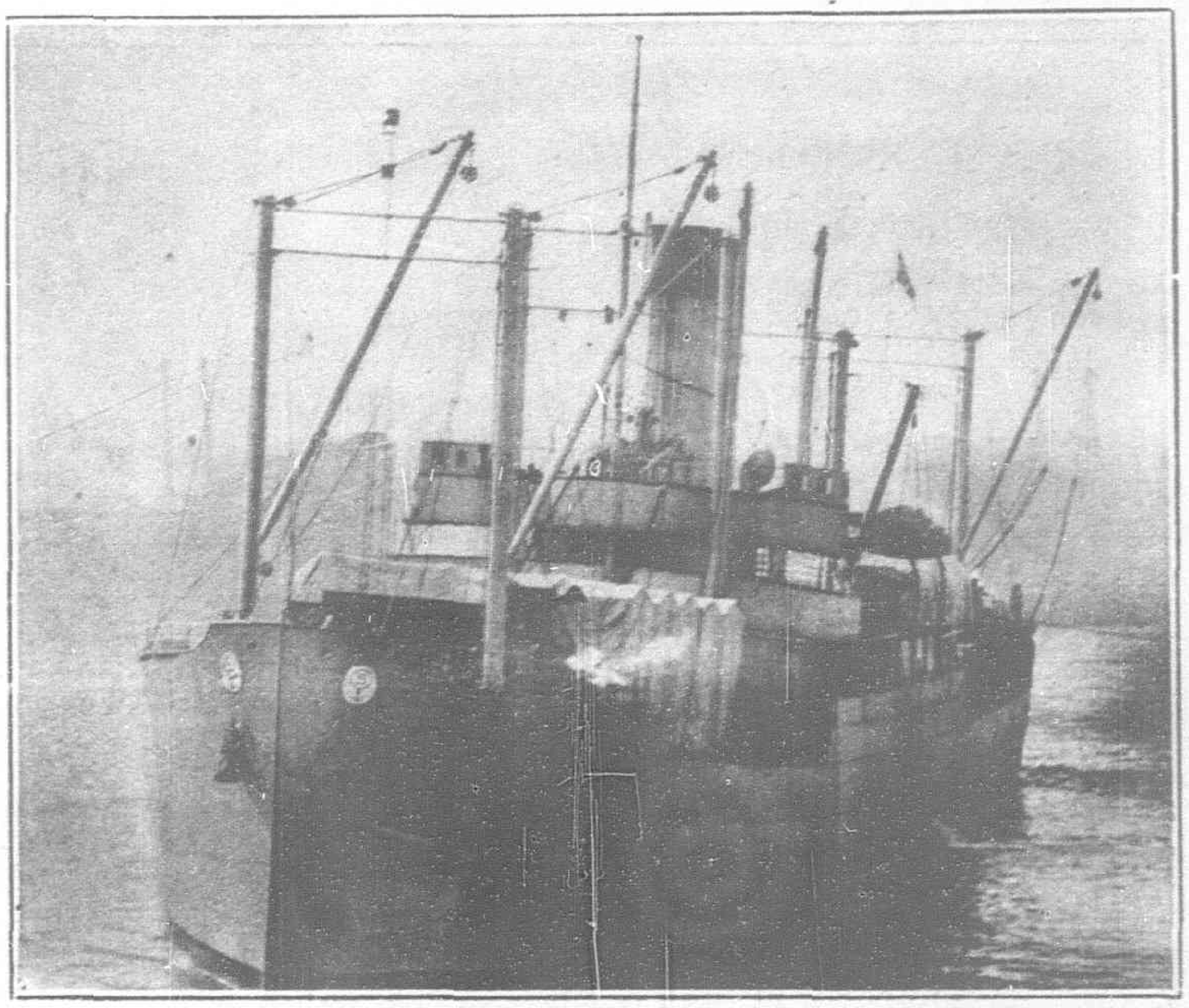
The engines, 17 in number, have recently been built at the firm's Scotswood works to the order of the East Indian Railway, and conform to the following specification :—

0-6-0 Type	SUPERHEATED LOCOMOTIVE			Gauge 5-ft. 6-in.
Cylinders	Diameter 20″	Heating	Tubes	917 sq. ft.
	Stroke 26″	Surface	Elements	223 ,,
			Firebox	126.3 ,,
Wheel Diameters	Coupled 3′ 1½″		Total	1,266.3 ,,
	Tender 3′ 7″			
		Firegate		25.3 ,,
Wheel Base	Rigid 15′ 6″	Area		
	Total Engine 15′ 6″	Weight in	Engine	50.95 tons
	Total Engine and Tender 39′ 0⅜″	working order	Tender	40.25 ,,
			Total	91.20 ,,

Boiler pressure 160-lbs. per sq. in.
Tractive effort at 65 per cent. boiler pressure 23,000-lb.
Tank capacity 3,000 gallons
Fuel space 7½ tons
Boiler feed 2 G. & C. No. 9.

The first photograph shows a number of the locomotives and tenders in the erecting shop prior to shipment. From this it will be observed that the engines are despatched in running order without any dismantling beyond the removal of the buffers, which is only done owing to limitation of deck space. From this shop the locomotives are taken to the jetty and are lifted by means of a 150-ton hydraulic crane directly on to the vessel moored alongside.

The second photograph shows the steamer leaving the jetty with the locomotives on board. Some of the engines and tenders are carried in special holds and the remainder athwart-ship on the fore and aft decks where they are secured against rolling by means of special shackles. Waterproof covers are provided for the deck-borne engines as a protection against the elments. The engines are fitted with special slings so that on arrival they may be lifted on shore and put into service immediately.

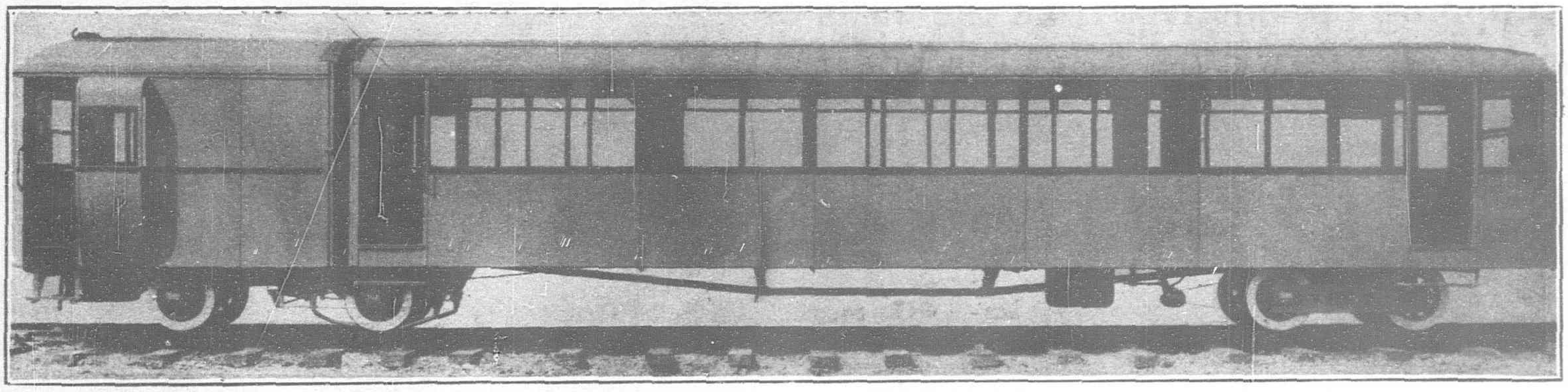


Steamer leaving the jetty with locomotives on board

Sir W. G. Armstrong, Whitworth & Co., Ltd., have already adopted this method of shipping locomotives on a number of different occasions, but hitherto the shipments have been made only to continental and Irish ports. On this occasion, however, shipment is being made direct to India and the experiment is expected to prove the feasibility of this method of despatch to any part of the globe. The advantages to be gained both in time and labor costs are undeniable as the locomotives on being landed are able to commence their useful revenue-earning career without the usual extended delay which shipping in packing cases and subsequent re-erection involves.

The despatch of locomotives complete is especially welcomed at the present moment in India, as all repair shops there are heavily engaged and cannot undertake the additional work of re-erecting dismantled locomotives received from abroad.

Locomotives in erecting shop ready for shipment



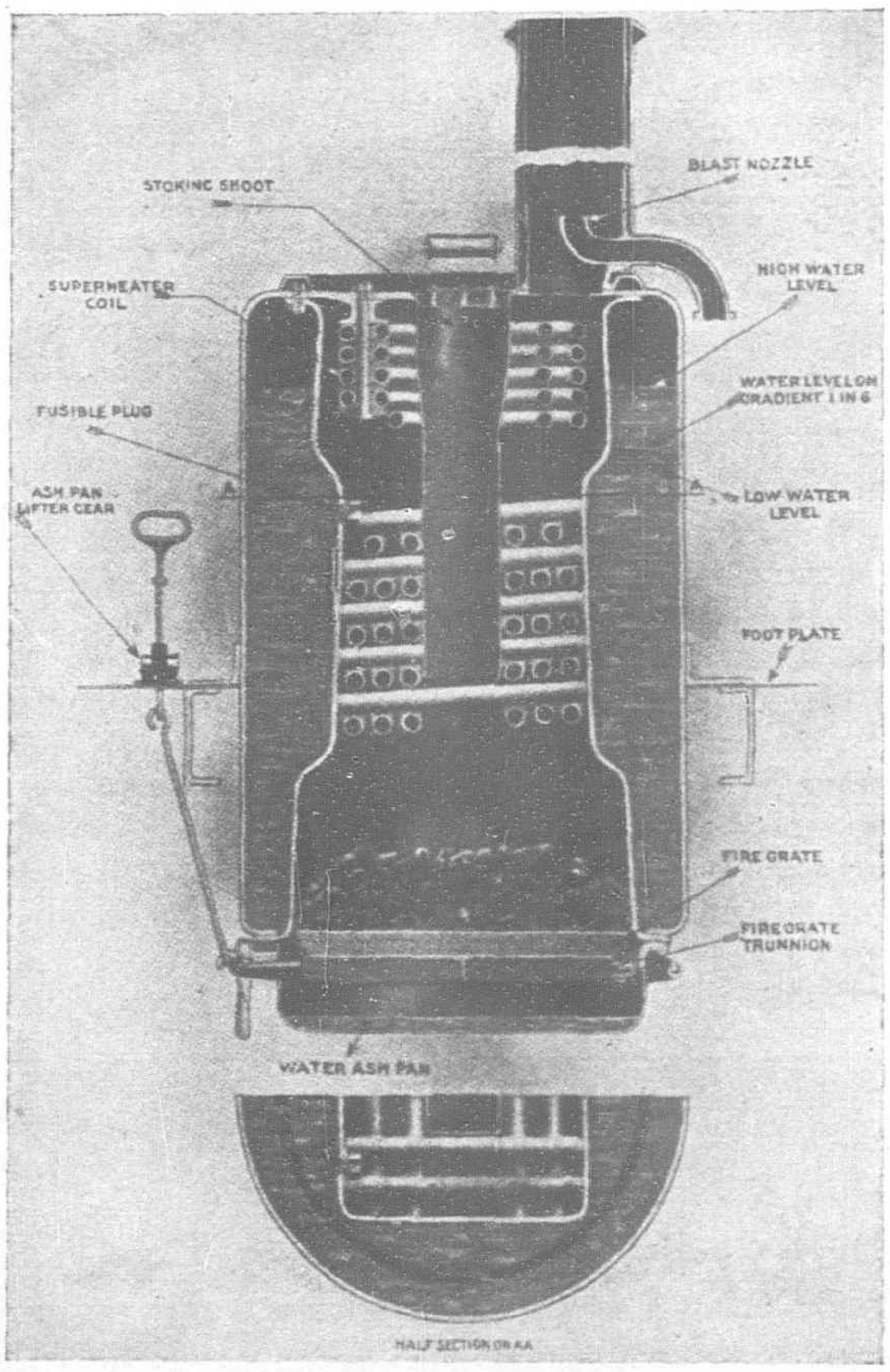
Steam Rail Coach for 50 Passengers.—Built by Cammell, Laird & Co., Ltd., Nottingham, England. Fitted with engine, boiler and controls, supplied by The "Sentinel" Waggon Works (1920), Ltd., Shrewbury, England

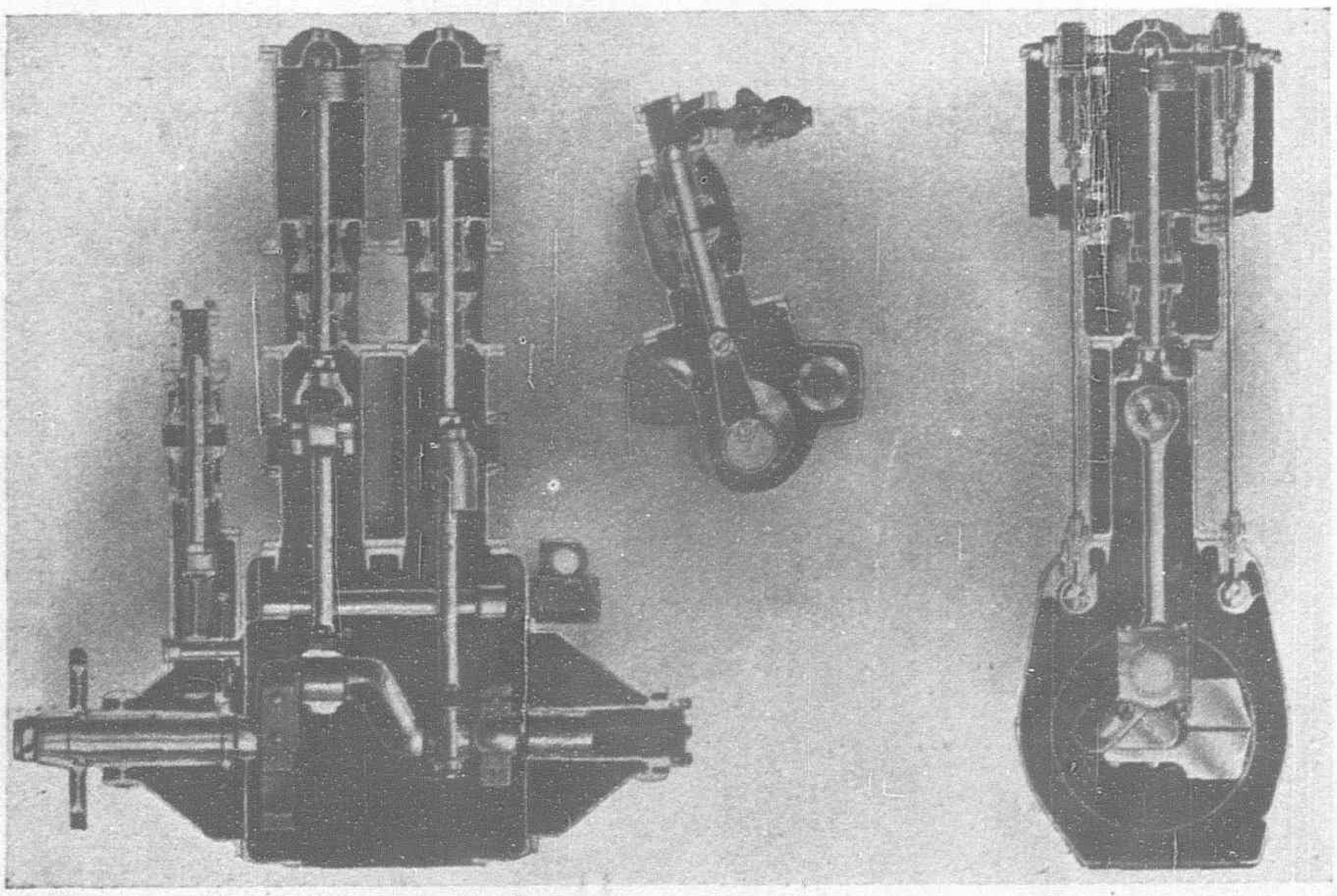
The "Sentinel" Steam Rail Coach

IN the early part of the present century quite a number of railway companies decided to attempt to operate branch line by means of steam-driven cars. The main idea was that such methods would be conducive to lower operating costs than those of ordinary locomotives and rolling stock. After various tests, the results were found in the main to be unsatisfactory from an economic point of view. The chief causes which contributed to the unsatisfactory results were that the weight of the vehicles was entirely out of all proportion to the number of passengers carried, while the motor coaches themselves were found to be too nearly modelled on the lines of regular railway rolling stock.

The railways recognized the difficulties they were up against in competing with road transport for the conveyance of passengers for short journeys and the transportation of goods in small quantities. The old-time methods of dealing with such traffic by means of the ordinary old-fashioned tank engine and coaches was found to be practically impossible to be continued unless at a heavy loss and consequently more economical methods were sought.

Seeing the difficulties that had to be overcome, and recognizing something totally different was required to what was already in existence, two of the leading British firms, both of which had many years of experience of locomotive waggons to their credit, evolved a railway vehicle, equally adapted to both passenger and goods traffic which could be operated at an overall running expenditure of 4d. to 7d. per mile. The higher figure includes the expenses incurred with a trailer and based on a service restricted to as little as 100 miles per day. The figures mentioned include all charges, *i.e.*, fuel, wages, repairs, depreciation, amortization, etc.





Top, Fig. 2: Vertical boiler with cross watertubes. Bottom, Fig. 3, two cylinder double action engine used in driving the "Sentinel" steam rail coach

The accompanying illustration depicts one of these new type vehicles, which is now in use on the Jersey Railways and Tramways Company's line. The line is a 3-ft. 6-in. gauge and is in consequence particularly adapted for rail car operations. The mechanical portion of the work has been executed by The "Sentinel" Waggon Works (1920) Ltd., while the body comes from the work-shops of Cammell, Laird & Co., Ltd.

The power unit itself is self-contained and is easily detached from the rest of the vehicle. It contains the engine, boiler, water and fuel receptables, controls, leading and driving axle, this last named being connected to the engine by a roller driving chain, and adjacent to the engine. A bogie is thus formed by the motor unit, with a wheelbase of 7-ft. It has a pivot to which the body is articulated, while the other end of the coach is carried upon a four-engine wheeled truck with a 5-ft. base. Between the sides and top of the engine cab and coach body there is a flexible connection, in order to render the appearance of the outfit symmetrical in every respect. The motor unit superstructure is made of steel plate with wooden doors, steel pannelled, on either side being a projecting look-out. In order to assist in taking stresses, and for other conveniences, the body of the coach is built integrally with the under frame. The bogie is constructed with side members and cross bars between which a well-sprung swing bolster is housed, the whole being very light and strong. Seating accommodation is provided for fifty-six, the interior being beautifully finished and decorated, as well as excellently ventilated and well lighted.

The boiler is of the vertical type with cross water tubes, central top feed for fuel, and with a coil superheater made out of solid drawn steel tube. The arrangement is shown in diagram 2. It is so constructed that the whole of the interior can be dismounted without in any way interfering with the external fittings, and notwithstanding its high efficiency as a steam generator, the consumption of coal at most does not exceed 41-lb. per mile. The whole arrangement is simple and economical to a degree. The working pressure is 230-lb. per square inch, and the superheat amounts to 100 deg. F. There is a heater which utilizes the exhaust steam and also insures delivery of the necessary feed water at approximately boiling point.

The engine, which is shown in diagram 3, possesses several unique and interesting features. It has a two-cylinder double action motor, the cylinders being $6\frac{3}{4}$-in. in diameter by 9-in. in stroke, the admission and exhaust are controlled by independent poppet valves worked by camshafts; these can be moved endwise in order to give the correct distribution for either forward or backward running. Cut upon the shaft is an intermediate set of cams which serve to keep the valves open in the "stop" position to order to drain and warm the engine. This type of valve affords a reduced clearance as well as providing a perfect immunity from leakage; by these means a high economy of steam consumption is secured, which never exceeds 20-22-lb. per brake h.p. and in this respect the engine is superior to many compounds.

Another important feature is that the cylinders and casings for the connecting rods, shaft, etc., are totally and entirely distinct from each other although they can easily be bolted together. The packing glands provide an oil-tight housing for the motive parts and keep them continually flooded with oil but prevent any steam or water from the cylinders reaching them. By means of this perfect lubrication, combined with the extraordinarily large bearing areas which are allowed, extreme durability is insured for all parts which are subjected to wear. This in any event should always be low, as the engine speed is only 240 revolutions per minute at 20 miles an hour, which corresponds to a mean piston velocity of 360-ft. per minute.

The crank shaft, which is very accurately balanced, is made from high carbon steel, while nickel steel is used for the valves, piston rods, and connecting rod bolts, the valves being made entirely of stainless steel.

The pistons, which are lubricated by a positive mechanical oil pump, itself driven by the engine, are fitted with three rings, the pistons themselves being of great depth. The mechanical pump has also another use in that it acts as a feed pump for the boiler supply apart from what is supplied by an injector.

By an ingenious device, the engine timing when reversed, converts the motor into an air compressor, and thus makes a most effective albeit a very gentle brake. Apart from this, however, both hand and steam operated brakes are provided, the drums in connection therewith being incorporated in the track wheels.

Although the power unit denotes great strength, the total weight of both it and the coach is but 12 tons whereas previous rail motors has always varied from 40 to 45 tons. Under such conditions it is easy to see the saving that may be made in the cost of newly constructed lines since it is clearly demonstrated that a 30-lb. rail will be ample for such coaches.

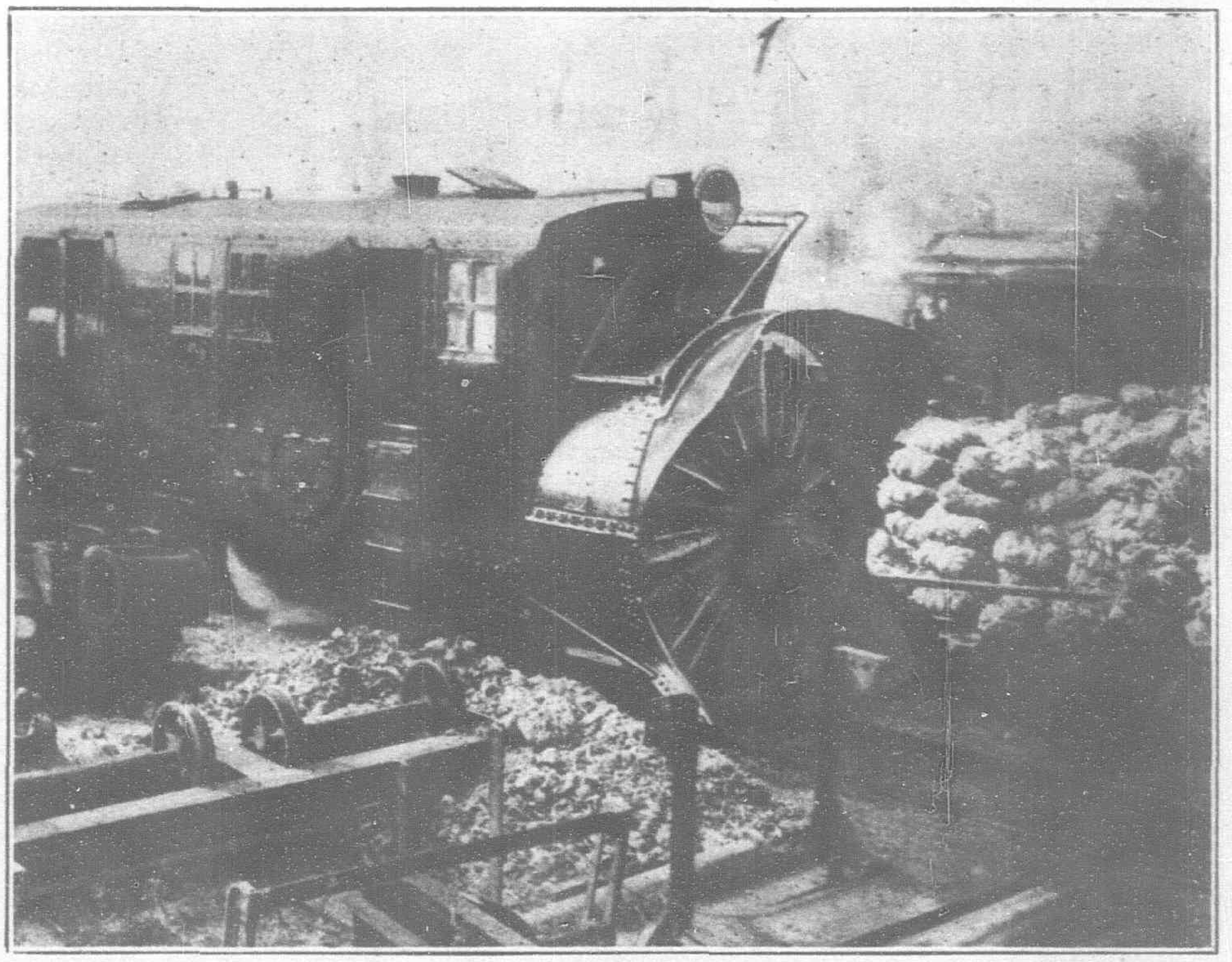
Summed up some of the most salient features of this new rail coach are (*a*) a great reduction in running costs; (*b*) extreme lightness the average weight per passenger being reduced from about 1,650-lb. to less than 500-lb.; (*c*) reduction in fuel and water consumption from 20 to 25-lb. and 18 gallons per mile to 4-lb. of coal and $2\frac{1}{2}$ gallons of water per mile; (*d*) the fact that the sentinel boiler is designed to burn coal, coke, wood or charcoal without alteration, while oil will shortly be added to apply to standard units; (*e*) the enormous saving in costs in laying new tracks due to the lighter class of rails required.

Rotary Steam Snow Ploughs for Japan

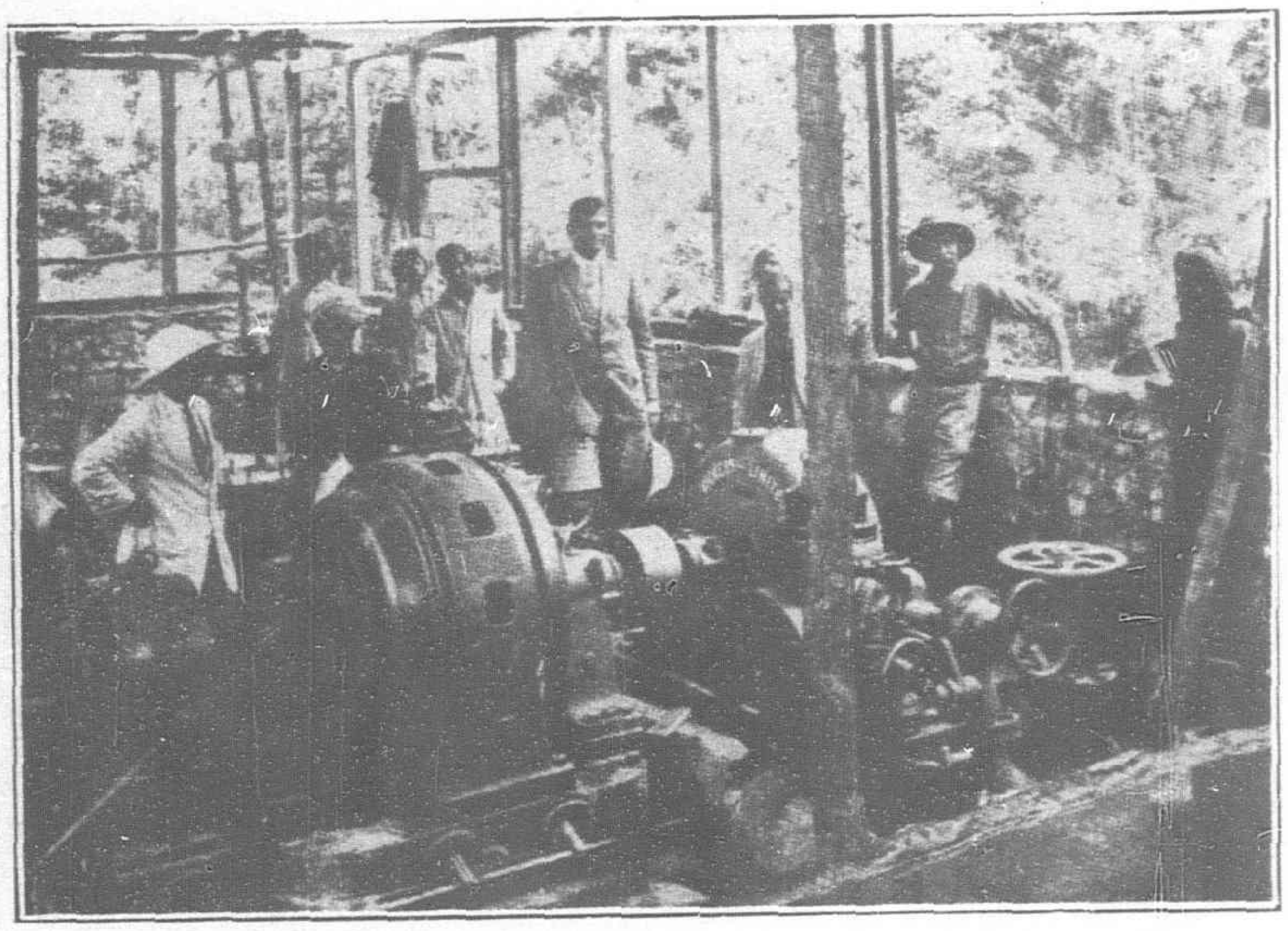
Two rotary snow ploughs have recently been purchased by the Japanese imperial government from the American Locomotive Company of New York as an experiment, and will be fully tested this winter in the heaviest snow country of Japan. If the results of the experiments prove satisfactory, many more will be ordered by the railway department from the makers, and will be used in place of the machines now in use.

Trial operations have already been made with one of the machines in the beginning of November in Kobe, when sawdust was used in place of snow. The rotary snow plough has a steel muzzle, ten feet in diameter, in which is installed a big drill fitted with ten double-bladed steel propellers, averaging sixty revolutions per minute. The plough is fitted with a 400 horsepower steam engine. The body is $12\frac{1}{2}$-ft. long and weighs 60 tons; the cost is between 140,000 and 150,000 yen.

One of these rotary snow ploughs will be sent up to Hokkaido and the other to the Tohoku district in the northern end of Japan proper for winter testing.



Rotary Steam Snow Plough, manufactured by the American Locomotive Company for the use of the Imperial Japanese Railways in the Hokkaido. These ploughs were set up at the Takatori shops and trials made by ploughing piles of sawdust.



One of two 143-hp. Vicker's Impulse Water Wheels coupled to 6-pole, 100-kw., 3-phase, 50-period, 2,200-volt Water Wheel Alternators, in course of erection at Shillong Hydro-Electric Station

Hydro-Electric Installation

THE hill station of Shillong-Assam is situated 5,000-ft. above sea level, and a town lighting scheme supply from a hydro-electric installation is now being erected there.

The plant consists of two 143-h.p. single section governing impulse water wheels by Messrs. Vickers, Limited, model No. 95. The discharge is 2.95 cubic feet per second with a net head of 546-ft. Each wheel is fitted with nozzle hand control and oil pressure governor with the necessary governor connections and drives.

Each turbine is also fitted with a pressure gauge and a speed indicator. They run at 1,000 r.p.m. and are each coupled to a 6-pole, 100-k.w., 3-phase water wheel alternator, 50-periods, 2,200 volts with overhung exciters pedestral bearings and bedplate.

The photograph which we are able to reproduce shows the station in course of construction. Judging from the background of trees, it would seem to be situated in a very pleasant spot.

S.M.R. Industrial Developments

ACCORDING to H. E. President Kawamura, of the South Manchuria Railway, the estimates of the S. M. R. Co. for the next fiscal year are now completed. The total development funds, as asked for by the different departments, reach Y.80,000,000. How far this total amount will be cut down is unknown, but may probably be reduced to the neighborhood of Y.40,000,000 in the end.

In the above amount is included the sum of Y.7,000,000 for the first stage expansion program of the Anshan Iron and Steel Works. The company is heartily desirous of carrying out the program. For the succeeding fiscal year, 1925, Y.4,000,000 is proposed to be set apart.

While the starting of steel manufacturing depends upon the results of the investigations now in progress, President Kawamura is personally strongly inclined to embark upon that line of enterprise. The president appears most sanguine about the technical value of the new hematite reducing system of treating poor-ore, which constitutes the major portion of the Anshan iron vein. His excellency seems also satisfied of the commercial feasibility of this system.

The president has also given out that the company is now going to give more attention to the fostering of all kinds of industry in the S. M. Railway area and in Manchuria in general. The enthusiasm awakened among the Chinese towards industrial activity in recent years is wonderful. The spinning mills newly founded at Mukden may be mentioned as among the most promising. A soda factory has been established at Tientsin. Then at Chinwangtao a glass factory has been brought into being on a large scale. Behind all these ventures there is always competent foreign counsel and guide. The drafting of the plans and specialists, while gether with the installation of machinery, etc., has been attended to by foreign specialists, while these plants are kept going under superintendence of Chinese experts. Many of them have graduated from Japanese colleges. The present boom in the industrial China reminds one of Japan of about 26 years ago.

The S. M. R. Co. has asked Dr. Nishikawa, of the Kyushu Imperial University, to come over to the Kwantung leased territory for a professional study of the ground as a site for alkaline industry. Whether the same industry has an economic workability or not still remains to be seen, and awaits a verdict by Prof. Nishikawa. Supposing the verdict is rendered in the affirmative, whether the establishment of the same venture shall be undertaken by the S. M. R. Co., under private management with the company's backing, also remains indefinite.

The Kowloon-Canton Railway

HONGKONG'S one and only railway seems to be falling from grace. It is a well-laid line, with substantial road-bed, broad gauge and heavy rails—in its way a model railway—and Hongkong has never regretted having built it nor having encouraged the Kwangtung authorities to make the connection with Canton. The British section of 22 miles, with the seven miles branch to Sha Tau Kok, was commenced in 1906, and the Chinese section in the following year. The capital sunk in the British line is put now at almost $16,000,000. The Chinese section (89 miles) has cost to date about the same sum, the money having been raised by loan to which British sources contributed. The Chinese end has never been particularly profitable, constant warring interfering with the traffic. The same causes have naturally had their effect on the British section, and despite careful management our 29 miles of track have not exactly made them rich. The net earning in 1921, to take a more or less normal year, was $75,989.71; but expenditure for that year totalled over a million dollars and revenue only two-thirds of that amount. The year 1922 showed a better balance, due partly to the increased traffic resulting from the seamen's strike, and partly to a reduction of special expenditure. For this year revenue and outlay were expected almost to meet, but again China's politicians have made the railway their sport, and a more than ordinarily severe typhoon has upset calculations. The capital sunk in the line is steadily mounting up and there is considerable justification for Mr. Lang's criticism in council that the undertaking is becoming an expensive item. The colonial secretary could only assure Mr. Lang that: "We have to keep it efficient in the hope that some day the Chinese section will also be efficient," and as to money expended for the Chinese section,he could not hold out much hope of recovery. Obviously, as was remarked, we cannot abandon the line: is it not to be the Oriental terminus of the wonderful iron way from London? Nevertheless, the position of waiting and hoping and spending is far from satisfactory. If Kwangtung became peaceful and if branch lines were built to open up nearby mineral and other areas, we need not worry; but before then many more typhoons must be voted for, and much Chinese suspicion removed. If we are to avoid interminable drain on our funds, it is time the government attempted to make our 29 miles support themselves as an independent unit. As between operating costs and income the balance is on the right side: it is the special expenditure that is running away with our money. For this year no less than $465,007 has been estimated, including $60,000 for extension to workshops, $100,000 for locomotives, $88,000 for a breakdown crane, $42,857 for boilers for locomotives, $32,500 for extension to carriage shed at Hunghom, and much more. Many of these things may be called for by efficiency, but perhaps not all. Under the circumstances the government might well apply the axe for the present, and as to the future, we would repeat our remarks of a few weeks ago on the subject of the development of the new territories. At present the railway practically depends on passenger traffic: there is no inland industry of sufficient importance to feed it with goods. If capital can be encouraged to take itself away from the city centre, it will be good for the railway, perhaps calling for several short branch lines, and good also for the community generally.—*Hongkong Telegraph.*

Administration by Electricity

(Continued from page 16)

According to their lights the Japanese have done their best. They have spared no pains to bring this region of swelling jungle hills under their influence. They have spent large sums of money. They have sacrificed many lives. They have tried both the method of 'suppressing' the uncompromising head-hunters and that of 'developing' them alternately. They have not treated them barbarously, as the Chinese did; on occasions thay have been unduly severe—Mrs. McGovern, for example, in *Among the Headhunters of Formosa*, mentions bombs being dropped from aeroplanes on defenceless villages—but once the natives have come under government influence they have treated them well, even though they persist in the 'assimilation' principle. The trouble is that after nearly thirty years there are so many natives who refuse to come to any sort of terms.

Taiyal Natives of Formosa.

The Japanese have met with extraordinary success in every commercial, industrial, economic and scientific enterprise they have undertaken in Formosa. Why they have failed in this one essential thing, the settlement of the native population ?

I believe the chief reason is lack of sympathy. When the Japanese first came to Formosa they were quite inexperienced in matters of colonial administration. They were confronted with problems thay had never been called upon to solve before. Most of these they learnt to solve, simply because they were not too proud to learn from others how to solve them. Some might say that they sent commissions and individuals to pick the brains of other governments, but the fact remains that they learn what they wanted to know and, what was more, put their knowledge into practice.

But there was one thing they did not learn, and that was how to deal with a primitive people, whom oppression had rendered intractable and truculent, such as those of the Formosan hills. Perhaps it was because they had so many other things to learn that this one thing was overlooked. Perhaps they thought it needed no learning. I am inclined to think that they underestimated its importance and despised the problem. They had an army; a battalion or so could deal with a handful of natives; that, I imagine, was what they mus have thought. They made the mistake of underrating not only the strength but also the indominable character of those pagans with whom they had to deal. In fact they never looked upon them as anything but a nuisance.

A Taiyal Grandmother.

I talked to many Japanese officials on this subject when I was in Formosa and they all gave me the same impression, they all looked at the question from the same point of view. The natives were an obstacle in their way; they despised them as 'savages,' even though by then they had come to learn that savages can be a power to be reckoned with. They seemed to have no faculty for making friends with the native tribes: the thing never seemed to enter into their heads.

Working-class people, when they have got on in the world, not infrequently look down upon those who were once their equals, while persons whose station in life is above both would not think twice of talking to either in a friendly way. This, and I say it without any intention of giving offence, has been the position of the Japanese. They have not been a ruling race long enough to unbend to those who come under their sway. One may see exactly the same thing when a European labourer or mechanic, who has had no previous experience of handling men, goes to a good position in the East and finds himself in charge of a number of natives. There is always the danger that he will look upon them as 'blacks' or 'niggers' and will treat them, not perhaps with actual cruelty, but as creatures so far beneath him as to have no claims upon his sympathy or consideration.

And I say deliberately that although the Japanese have not treated their Formosan natives with actual cruelty, they have not treated them with sympathy. Even those with whom they have come to terms they are 'assimilating'; they are teaching them the Japanese language and instilling into them Japanese customs, not realizing that these pagans for whom the have made themselves responsible have a perfectly good language and perfectly good customs of their own. If you wound the individuality of a race you wound its very heart, and its death is only a matter of time. The Formosan government makes its natives learn Japanese rather than send trained administrators to learn the native tongue; they are destroying the spirit of the pagan race rather than fostering it. That is why the pagans are slow to surrender to Japanese influence; that is why the Japanese have failed.

It may be of interest to see how, if the Formosan government adopted other measures it might achieve better results. When the British North Borneo Company acquired its territory, the size of Scotland, 44 years ago, the country was in very much the same condition as the Japanese found the hills of Formosa. The natives had long been oppressed by the coast Malays, they were suspicious of strangers, they waged unceasing warfare amongst themselves. There was uo semblance of orgcnized government. The cheapest thing in Borneo was human life. The country was a tropical wilderness; there were no roads and, save for the clearings of the native tribes, the jungle was everywhere. Yet a handful of European officers and a small force of Indian and native military police, with no wealthy treasury behind them, within ten years had brought the greater part of North Borneo under government influence and so administered the native tribes that the jungle paths are as secure as the pavements of Pall Mall. The headhunters have ceased to raid and live at peace. The natives thrive and increase; they are treated with sympathy and understanding; their rights and customs are respected. They look upon their district officer as their guide, philosopher and friend. They bring him their cases to try, they go to him for medicine, they even ask him for advice about their erring wives. All this has needed patience, tact and courage to accomplish, but it has been done. Given the right men to do it I believe that it could be done in Formosa to-day.

The Japanese did make some experiments in this direction soon after the occupation, but unfortunately they did not go far enough. Officers were established along the native border so that they might get into close personal touch with the tribes, learn their language and customs and gain their confidence. But instead of making these posts attractive and well paid and entrusting them to men of proved administrative ability, the government apparently considered them of minor importance and to fill them appointed subordinate officials whose status and pay were little better than clerks. The experiment did not turn out a success and was abandoned in 1898; the control of native affairs has been in the hands of the police department ever since.

This, obviously, was not the way in which the problem could be solved. In dealing with native races it is not so much the system which counts as the man. Natives are little more than children; in fact when dealing with them one is dealing with a race in its infancy. So that a native should be treated not as 'savage' but rather as a child. He has the same quick prejudices, the same instinctive likes and dislikes, the same fears and superstitions and wild terrors as a child; he is as easily moved to hatred or resentment or sudden mistrust as he is to laughter or affection. His mind is wax, quick to receive impressions; he will meet cunning with cunning and courage with respect, and he expands to sympathy as a flower to the sun. Discipline, as we know it, is alien to him and must be enforced gradually. He resents compulsion; threats provoke him and trickery arouses his hatred. And how can he look upon a mine or an electrified wire as anything but a trick?

I am no believer in the pampering of the native. A native appreciates justice and firmness: these are the foundations on which to build, but one must use the mortar of humanity. This is all the more necessary with the Formosan, who has been so barbarbously treated by the Chinese for centuries that he is become like a baited dog, ready to turn even upon those who would be his friends.

Even so there is evidence to show that the Formosan pagans, when approached and treated in the right way, are not the uncompromising people the Japanese sometimes make them out to be. There is the evidence of the Dutch and other Europeans to show that they were tractable in their dealings with white men, and quite recently Mrs. McGovern was able to go about amongst them in spite of the warnings of the Japanese authorities. If the Formosan government asked to-morrow for twenty young Englishmen with experience of administering native races they would get the men to send into the Formosan hills. They would probably have thousands to choose from and I believe that in this way the whole of the 'savage' area would be settled in five years. But the solution does not lie there. Japan is too proud now to allow another race to do for her what she has failed to do herself. And rightly, for every nation must solve her own problems.

The task which Japan has begun she must bring to a conclusion. She can only bring it to a successful conclusion by getting her best men, sending them to another colony, such as North Borneo, where similar conditions prevail, to learn proved and tested methods of administration, and, once they have learnt their lesson, send them to serve as district officers to govern the native districts of Formosa. They must be volunteers, for there can be no pressure for such service. They will have to sacrifice comfort, perhaps health, some of them perhaps even their lives. But theirs will be work worth the doing and they will have their reward. They will learn to live amongst these primitive people, speaking their language, becoming acquainted with their customs, gaining their trust and teaching them the benefits of living under a just and benevolent administration. They will travel across those jungle hills from village to village, as a district officer travels in Borneo, attended only by a policeman or two, sleeping in the native houses, trying cases, adjusting disputes and making friends. They will find a way of settling the existing head-hunting feuds by the payment of blood-money, inducing age long enemies to make peace by swearing solemn oaths in their own fashion—oaths which once sworn they will find will not be lightly broken, for even a pagan knows how to keep his word. They must respect native prejudices and traditions; they must see to it that their people are not exploited—that their rights are recognized and safeguarded and, if the districts are opened up, that natives reserves are made and that their lands and other property are not wrested from them by unscrupulous traders or speculators. Wherever they go they will plant seeds of confidence, and gradually good feeling will spring up and they will find that these once truculent savages will come to them not only to have wrongs put right but to ask their advice on the little troubles of every day.

I do not pretend that it is likely to be plain sailing. There will be failures, there will be disappointments, there will be dangers. There may be outbreaks of head-hunting; there may be native risings which will be troublesome to put down. But in the end I am confident that the right men well succeed, just as I am confident that by this means along, short of the extermination of the aborigines, can the land the given peace.

Once the foundations of such an administration have been laid let the government abandon the policy of 'assimilation.' Assimilation in the long run means nothing but the fading of a native race and the object should be to make it bloom. Let education, anyhow at first, be voluntary; let the natives preserve their own language, their own ways, their own ideals. Let native courts be established under the supervision of the district officer to deal with cases involving breaches of native law and custom: as far as is consistent with humanity let the people be judged by their own standards rather than by those of an alien race. Let a police force be recruited from the native tribes, so that each policeman with his uniform and his rifle forms a bond between the government he serves and the village from which he comes. Let natives chiefs be chosen from the tribes and set up by the district officer in position of authority; but let the district officer be careful whom he trusts, lest he gives power into the hands of the wrong man; for among so primitive and so impressionable a people one traitor in authority may undo the work of years. Above all, let him remember that these brown people of the hills have a tribal spirit and tribal traditions of their own and let him be glad that they should keep them, for they will be happiest, and so most easily governed, when they are allowed to live their own lives once they are at peace.

Thus may the district officer come to know and to understand—and perhaps to love—the people he is sent to rule; thus may he have his finger upon district's pulse until he is so in tune with its beating that, like a mechanic with his engines, he can tell by instinct if anything is going wrong.

All this is not visionary; it is not Utopian. It has been done, and it is being done, elsewhere. I shall never believe that Japan cannot find the men who would do it too. And it will be well for those simple people of the Formosan hills and well for the Japanese themselves, when the imperial government realizes that one good district officer who can dominate and influence his natives in the right way is worth more than a battery of field-guns and a hundred miles of electrified wire.

The Changing Chinese

(Continued from page 12)

toward foreigners. But in reality this condition is wholesome both for Chinese and foreigners. It will make foreign officials less arrogant and will thus prevent those constant little pin-pricks which impede the development of friendly relations due to tiny men getting jobs which in their own countries would entitle them to a seat below the salt but which in China places them to the right of the greatest official. Furthermore, foreigners like to know exactly where they stand. All this scraping and bowing and polite language gets one nowhere. If there is opposition, the closer it is to the surface, the easier it will be to handle it and to prevent it from becoming bitter and chronic.

The Chinese are changing. They are changing all the time. They are becoming their own masters and are learning to do modern things in a Chinese way. They realize they cannot be fought by armies and navies and so they are taking their time in making changes. They are in no hurry. If it takes a decade to make China modern, let it take a decade. If a century, let it take a century. If the foreigners don't like it, let them trade elsewhere, they say. The logic of the situation is with them, for China trade is still good and everyone wants to be in it. A few old-timers get peeved every once in a while at the conduct of the Chinese but as long as business is good, one says very little about them that is unfavorable. When business is bad, there is a howl about bandits, pirates, robbers, inefficient government. When business is good one enjoys the spectacle of the civil war as one enjoys Charlie Chaplin. Meanwhile, China moves and is changing. And as long as this process goes on, with its actions and reactions, its pleasant symptoms of progress and its unpleasant realities of slowness and uncertainty, China is on the road to better things. It is the nation which stands still, the country, permeated with dry rot, which is on the road to her end. There may be plenty rotten in China, but even the form of rot is changing.

Rubber Growing in the Philippines

HARVEY Firestone, president of the Firestone Tire and Rubber Company, attacked the British act restricting the production of rubber, at a meeting of the foreign commerce group of the chamber of commerce of the United States. He declared that the American rubber industry should no longer be dependent upon foreign countries for a supply of its raw material and suggested that the United States should produce its own rubber in the Philippines.

Mr. Firestone declared that there was a crisis in the rubber industry, due to the restriction of production and the increased demand because of the rapid increase in this country in the use of the automobile and motor truck. During the war, he said, the United States could not get a pound of rubber, except by consent of the British government, and he had no complaint regarding the manner rubber was obtained during that period. After the war, he added, a British committee, headed by Sir James Stevenson, was appointed, with the result that the committee recommended to the British colonial office the adoption of what came to be known as the Stevenson committee act.

" Before the adoption of this act," he continued, " it was generally understood that certain interests contracted with the planters in the Dutch possessions (who had refused to join in a proposed restriction of production agreement) for all the rubber they could obtain during the next two years. The Stevenson restriction act proposed to reduce the production of rubber to 60 per cent. of normal, considering the output of 1920 as the basis, which gives the world's production at 330,000 tons. Applying the Stevenson act, the world production for 1923 would be 265,000 tons. A very conservative estimate of the world's consumption in 1923 is 400,000 tons, leaving a shortage of 135,000 tons, or over 50 per cent., provided this restriction act is adhered to according to the law as enacted.

Declares it is More than Tax

" The British restriction act is often called a tax on rubber. This is misleading. While the legislation mentions only restriction upon exportation, it in effect restricts production and is not sufficiently flexible to remedy a shortage of supply which is sure to result under its provisions. It must be borne in mind that this restriction scheme is for the purpose of restricting production, creating a scarcity and enhancing the price of the product for the benefit of a small group of plantation shareholders in London."

Mr. Firestone said that the restrictive act should have received greater criticism in the United States, which uses more than 70 per cent. of the rubber produced. Passage of the act., he said, aroused great opposition in England and its rubber-growing colonies. He explained a drop in the price from 35 cents to 29 cents a pound during February, March and April on the theory that the rubber growers, through the British colonial office, either could not control the rubber-growing possessions or did not want to control them for fear the price would go too high and the restrictive act would have to be repealed. " My personal judgment is that it is both," he said.

" We have men in England and in the British and Dutch possessions watching the situation very closely and the rubber growers' association is very much concerned as to what may happen to the restriction scheme. The rubber growers' association has a propaganda fund of £40,000 ($200,000), purported to be for the development of new uses for rubber. The rubber association of America also has a propaganda fund, purported to be for the correcting of any misstatements and quieting any misapprehension concerning the restriction act. These two organizations, the former in England and the latter in America, are very powerful financially and politically and it would seem that they could carry out almost any program they desired.

" I have endeavored to present to you a picture to enable you to visualize the importance of rubber and the critical position our country occupies in connection with that product. Authoritative figures show that the amount of rubber consumed in the United States in 1904 was 26,346 tons ; in 1910, 42,000 tons ; in 1915, 112,594 tons, and in 1920, 248,791 tons. It is estimated that in 1923 we will use 325,000 tons. If we hope to continue to increase our development of highway transportation we must look forward to a new source of rubber supply."

Advocates Philippine Production

Mr. Firestone said that the United States departments of commerce and agriculture were starting an extensive survey with a view to America producing its own rubber in the Philippine Islands, South America, Central America, Mexico and even the continental United States. He declared that newspaper statements that rubber could not be produced successfully in the Philippines were due to hostile propaganda, for the purpose of upholding the present restriction program and preventing America from establishing her own sources of supply.

" The fact of the matter is that the Philippines offer exceptional opportunities for the growing of rubber," he said. " This statement is substantiated by government officials who have made a close study of the situation and by others interested in seeking the proper development of the islands.

" The growing of rubber in the Philippines is no longer an experiment. Nearly 100,000 trees are to-day being tapped on Basilan Island, and several hundred thousand more trees will soon begin to yield. There are about 200,000 Castilloa rubber trees growing wild in Mindanao. The Agusan Valley of Mindanao a vast fertile area of 4,000 square miles, offers inducements that are immeasurable for the growing of rubber.

" With certain changes in the land and labor laws the Philippines will be a grand garden spot for the growth of rubber, promising to excel the Malay Peninsula and other regions now prominent in the industry.

" What is needed to bring about this great transformation is capital, and I urgently appeal to America to raise that capital so that this country eventually will be free from the foreign grip now held on the production of a commodity of vital importance to the public."

Railroad Expansion in Dutch East Indies

THE new standard gauge railroad under construction in Dutch Borneo from Martapoera to Bandjermasin, a distance of 40 kilometres, is being pushed toward completion. The work is being done by the Samarang-Joana Tramway Company, which already has several hundred kilometres of standard gauge track in operation on the island of Java.

Bandjermasin, which is reached from the sea on the Barito River, will soon be connected by this railway with Martapoera, which is the centre of the native diamond industry and lies in one of the richest sections of Borneo.

A second railroad is expected to be constructed soon, as plans and details have long been worked out, and in fact was much earlier under consideration than the one now nearing completion. This new railroad is to connect the rich regions of Sambas on the west coast by way of Singkwang, with the residency Pontianak, a distance of about 160 kilometres.

On the island of Celebes railway construction on the line from Makassar, the principal town in the south, going south to Takalar, 45 kilometres along the coast, is progressing. All grading, earthworks, bridges and culverts have been completed.

Plans for another line running north from Makassar are well under way.

Sumatra is showing greater activity in railway building than any other island of Netherlands India. Communication is being rapidly established between Telok Betong, in the extreme south with Palembang toward the east.

The crossing from Java to Sumatra by the boats of the Koninklyke Paketvaart Maatschappy, is, of course, the most difficult part of the entire trip and as long as present conditions do not change, six hours will be required for the 100 kilometres that are separating the two islands.

The Netherlands harbor works is also completing for the government, a railway 40 kilometres in length between Moeara Enim to Iahat. Steam shovels were used on this construction for the first time in Insulinde.

Steels Used in the Textile Trade

A Few Notes on Selection

By H. Scholey

THIS subject is one which has always strongly appealed to the writer of these notes, and when, considering the very primitive methods of our forefathers of making up wearing fabrics, it is very impressive to note the progress that has been made in the manufacture of the plant and machinery used in the present-day mill. The wonderful looms and spinning machines of to-day are a credit to the British engineers who have evolved these uncanny machines from the humble but nevertheless far-reaching invention of Arkwright.

In this connection spindles come into one's mind most readily, but there is a great variety of components other than the spindles used by this industry, and the steels which are taken for the various parts will be commented upon later. However, to make these comments as brief as possible, we will commence with a few observations about the aforementioned spindles.

Spindles.—These may be divided generally as follows :

(*a*) Roving Spindles.
(*b*) Mule Spindles.
(*c*) Cap Spindles.
(*d*) Loom Spindles.

These are usually supplied in the best Sheffield doubled reeled finish, but in certain instances makers prefer bright drawn spindles. Perhaps the ideal steel for roving spindles is one that has a carbon content of 1.10 per cent. to 1.20 per cent., but there is no hard and fast rule here, as various makers have evolved from their own practice certain variations from this, and one would find manufacturers going down in carbon content to .80 per cent. or .65 per cent. in the very large sizes.

Regarding mule spindles, there is not so much diversity in the practice obtaining with regard to the steel used. Generally speaking, a harder steel is taken because of the small sizes required and the rigidity that is demanded of all really good spindle steels.

Cap spindle steel is one which must be very rigid, and steel with carbon content of 1.20 per cent. is found to give the best service.

Loom spindles are usually made from steel containing about .90 per cent. to .95 per cent. carbon.

It should be noted that the afore-mentioned refer chiefly to spindles used in the cotton and woollen trades. The more experience one has of the steel used for spindles, the more it is realized how differently various manufacturers select their steels. One notices that very often some of the best makers steadfastly adhere to crucible steel for their spindles, and in this they no doubt act very wisely when purchasing from a reputable maker. Since the advent of the Siemens process a great quantity of spindles have been made from this class of steel, and in the writer's opinion, a really high grade Siemens steel is to be preferred to the crucible, inasmuch as a large bulk of steel of one uniform analysis can be obtained and more regular results assured to the ultimate user.

The next point that occurs to one's mind is the tendency to introduce bright drawn steel in order to economize in the production of the finished spindles, and one cannot avoid thinking that this is a serious mistake. The writer feels that nothing like the same service can be obtained from this type of drawn bar as compared with the blue reeled steel of the proper temper throughout. The reason for this opinion is that it is usual, when supplying bright drawn steel for spindles, to take a medium hard steel, and in order to facilitate the drawing, this has to be annealed, and although the finished product may appear stiff and rigid, this is usually not more than a mere skin hardness. Consequently, the wear when in use is much less than is the case with the older and much more satisfactory blue reeled bar. This point will no doubt be appreciated when considering the high running speeds of the spindles and the strain that is placed upon them in carrying heavy bobbins.

In the writer's opinion there is no doubt that the rigidity of the spindle and its readiness after any undue strain immediately to resume its position in true alignment is a very important factor. Quite a number of makers test their spindle steel by placing it in a holder, leaving one end free, and subjecting the free end to a given bending strain. On releasing the pressure the permanent deflection should not exceed one-hundredth of a millimetre. Of course, the bending pressure imposed is fixed in ratio to the size of the bar.

Flyers.—Three classes of steel are used for making flyers, which may be set out as under.

Spinning Flyers.—Two tempers are usually taken for this type of flyer, some makers using a high quality steel of about .60 per cent. to .65 per cent. carbon, and others a steel ten points lower. The essential feature of this class of steel is that it shall forge or smith easily into the form of these components. The feature most desired, as in most texile steels, is material which is exceedingly clean to machine up.

The Standard Type of Flyer.—This is an exceedingly difficult article to produce, and the resultant flyer is a credit to British workmanship and the smith's art in particular. Despite the splendid skill and workmanship which is embodied in one of these articles, the great thing is to have a suitable medium with which to work, as the steel used has to stand the severest forging treatment, yet it must be when finished, ground and polished, flawless, and absolutely free of all minute surface or subcutaneous imperfections. The point the writer emphasizes respecting flawlessness will be justly appreciated when it is borne in mind that in our great mills containing thousands of machines, constant stoppages caused by the breaking of fine strands of cotton or thread due to minute imperfections in the steel (usually invisible to the naked eye) would be fatal. What then, may one ask, is the ideal steel for this purpose, and to this it is difficult to give a ready answer. However, one can give one's own experience of the steels found to be best suited to the purpose.

(1) First on the list comes a good dead soft Swedish steel of approximately .08 per cent. to .14 per cent. carbon, but owing to the demand for a cheaper article which answers well, this very suitable steel has been largely replaced by.

(2) English Siemens steel of similar composition to the Swedish afore-mentioned, which has also given great satisfaction. There are, of course, cheaper steels on the market, but on the whole they are not cheap in the long run, many failing in the smithing process, causing wasters and loss of workmanship, apart from the trouble caused to the ultimate user in the mill from the reasons referred to earlier, namely minute surface imperfections in the steel.

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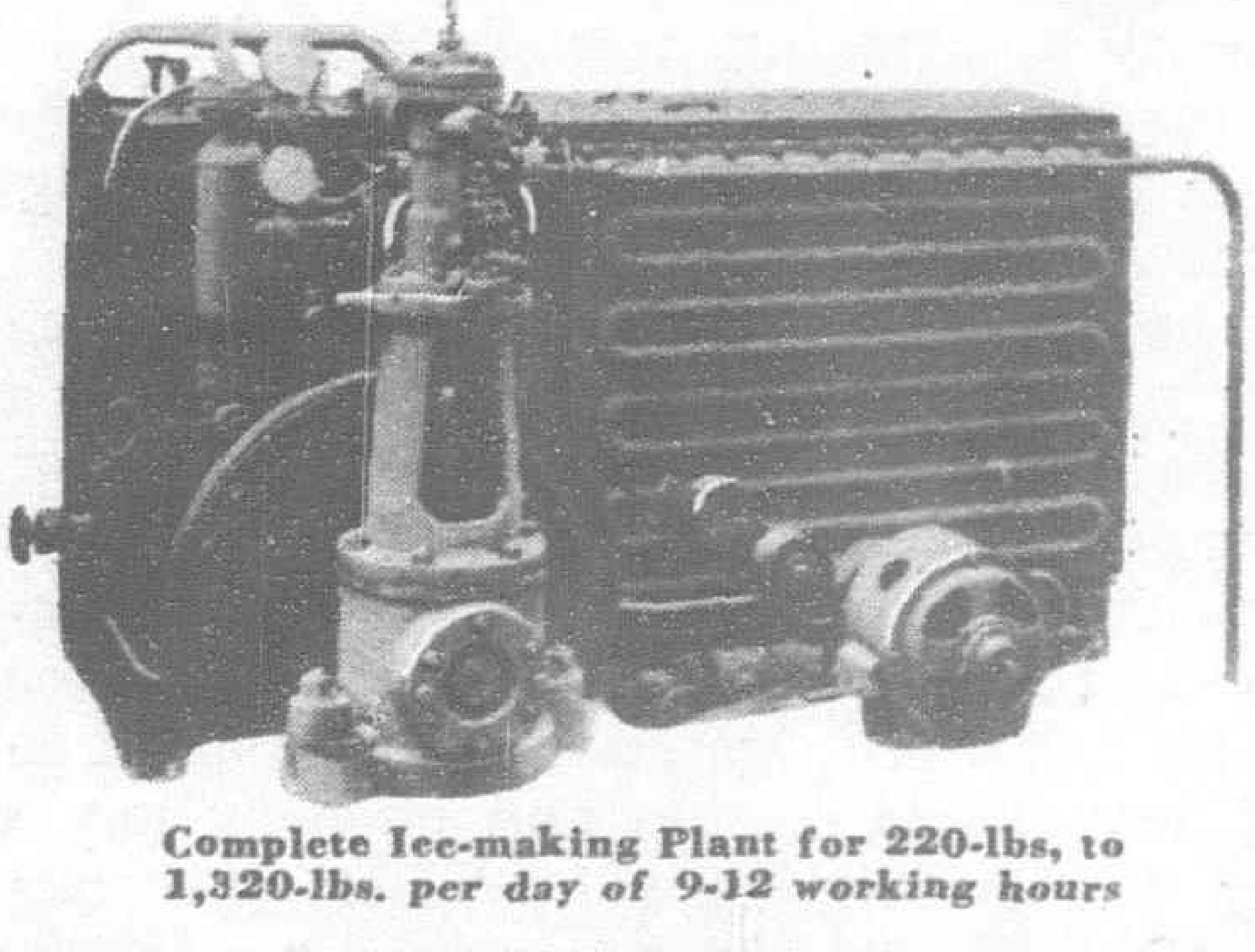

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